The
Chemical Age

LXII 17 JUNE 1950 No 1614

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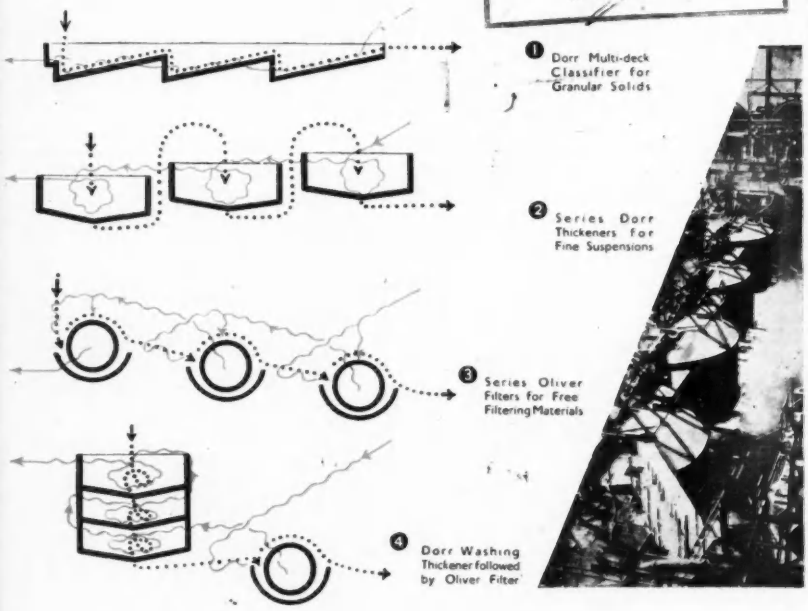

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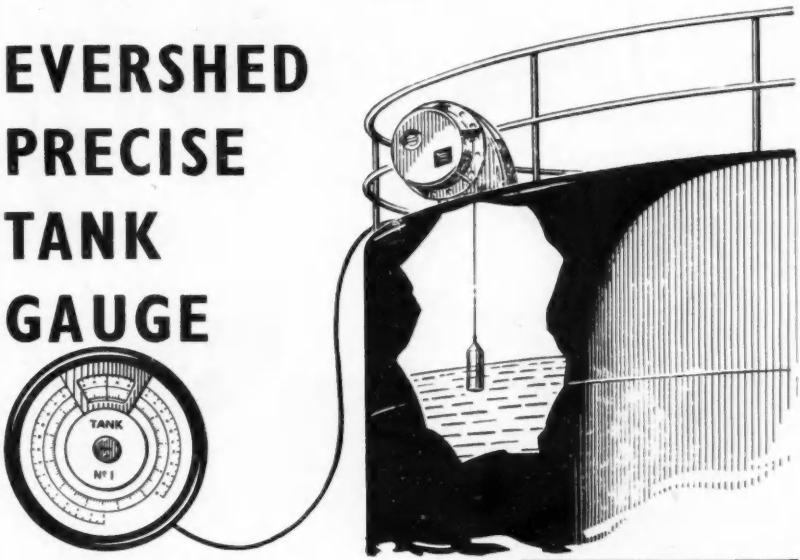

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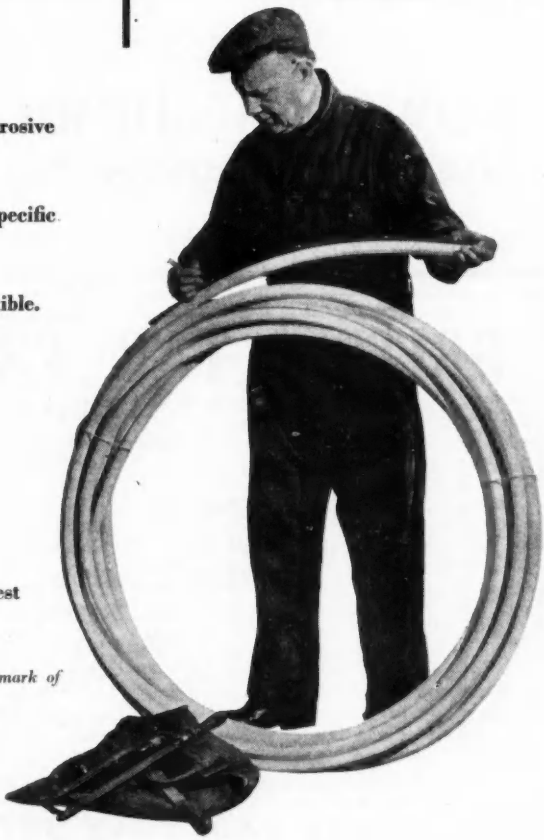

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The
Chemical Age

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Safeguarding Medical Invention

THE great growth of invention in biological materials and medicines in general has been one of the outstanding facts in the broad field of chemistry since the war. The useful preparation in its final form almost invariably has owed much to the work of chemists and biochemists, even in those instances where the initiative derived from a medical practitioner or, more frequently, a medical research worker.

To the large chemical organisations from which come most of these healing materials the protection afforded by the Patent Office is an essential condition for profitable and progressive activity. No such protection can, however, be invoked by the medical man who may isolate a valuable new material and perhaps indicate the route by which it can be made available. By an admirable but antiquated canon of medical ethics no medical man may patent his discovery. That principle, which is a great deal older than the resolutions in 1903 and 1920 of the Central Ethical Committee of the British Medical Association which made it obligatory, has now been reconsidered and the adverse evidence which has come to light strongly suggests that the BMA, at its annual meeting on July 13, will dispense with it.

Such a decision would represent a profound change in outlook, seen from the medical man's standpoint, and would seem to have everything to recommend it. While there is no prospect whatsoever that the ordinary medical practitioner will now develop as an innovator and patentee—the BMA recommendations in any case are still opposed to private patenting—the chances of a new therapeutic substance achieving the large commercial production its usefulness may require would be greatly improved.

The report on which the BMA Council is being invited to make an end of the "no patenting" rule supplies some remarkable reminders of the anomalies which have flourished under the existing system and clearly indicates the changes that have occurred in recent years in the means by which advances are made in the therapeutic field. It recalls, for example, that patentable advances now are made not by clinicians but by research workers, who in most cases are not qualified medical practitioners. Chemists, physicists and engineers are also recognised to be very large contributors in the

On Other Pages

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production of a new material and the ethic which formerly was acceptable to doctors cannot be appropriately urged on them. There has also been a considerable change in the general type of new medical products, many of which are chemotherapeutic substances produced by large industries. The naturally occurring materials and their derivatives with which the doctors and apothecaries of old were mainly concerned no longer figure in the field of innovation, and biological and chemical substances cannot to-day be sharply distinguished.

These are a few of the many persuasive arguments by which the BMA will be urged to declare "that there is no longer any objection to the patenting of inventions for which members of the medical profession are responsible, provided such patents are assigned to the National Research Development Corporation with a view to their administration in the best interests of the public as a whole". The NRDC can, of course, offer suitable payment for inventions assigned to it. Thus agreement may be reached between the irreconcilables which in the past precluded a medical man from benefiting by the outcome of his observation and enterprise—the ethic that the results of medical research should be dedicated for the benefit of humanity, while patent law and practice permitted a temporary and conditional monopoly. If the representative body of the BMA accepts the proposals now being recommended to it the repugnant possibility of selfish exploitation of some essential new clinical material will no longer be a serious problem, and medical invention may have the help of the development fund of the NRDC.

These are the aspects of principal interest to medical men. There is in addition a further recommendation for action by the BMA, one which has long been obvious to chemists and others. So long as the "no patenting" rule is maintained no ownership, even on a national basis, can be exercised over the basic discovery of the medical scientist. The BMA Council has cited several examples of the injustices which can occur in those conditions, the predominant instance being penicillin. Because there was no "central patentee" of penicillin the British consumer has today to contribute royalties to American firms for penicillin made in this country.

Notes and Comments

Chemical Engineering Research

MORE than three years have passed since the Mechanical Engineering Research Organisation was formed under the *ægis* of the Department of Scientific and Industrial Research to fill a conspicuous gap in the national organisation of research. MERO's programme is of vital interest to every mechanical and chemical engineer and to countless industries. Yet no information about that organisation's activities has been released to the Press, beyond a very general statement regarding the establishment of new mechanical engineering laboratories at East Kilbride. Scraps of information which have since come—unofficially—to light show that an important chemical engineering element is planned as part of the East Kilbride programme. It is fairly certain that MERO has by now formulated its programme for the organisation of its research. But that is merely speculation. In the absence of any official statement it might be concluded that nothing has been achieved since the statement on East Kilbride was issued—more than a year ago—and that the reason for this exaggerated reticence was the absence of any progress to report.

DSIR Policy

IT is understandable that scientists should be reluctant to discuss specific investigations before finality has been achieved, although that policy, too, is sometimes carried to excess by withholding important news pending publication in a specific scientific journal—which is probably not seen by the majority of industrialists or engineers in the particular field. The deferment of publication of the objectives or results of Government research, the cost of which is borne by the public, is much harder to excuse. The public is entitled to know how the money is being spent and it is not apparent that anything can be gained by withholding general information regarding research programmes. Almost all organisations make a practice of supplying the Press with annual and progress reports and applied science is generally not prone to dispense with the aid of the Press in making its achievements known to industry. One of the functions of the DSIR organisations, which have generally been performed extraordinarily well in the past, is to make closer the liaison between the many research laboratories and industries. The chemical engineering industry, of which the research needs are outstanding, seems at the moment to have been excluded from this principle.

Science and Diplomacy

ELOQUENT of the deep respect in America for science and its practitioners and the confidence there in the capability of the latter to help shape current affairs is the scheme lately reported from Washington to establish a world-wide network of American scientist-diplomatists to help gather and give out research information. The suggestion was made by an influential U.S. Government committee headed by Dr. L. V. Berkner, a special consultant to the Secretary of State, after a review of the Hoover Commission's proposals for reorganising the conduct of United States foreign relations. The aim is to set up overseas science staffs in the principal American embassies—one such staff has, in fact, been working in London since 1947. Others are suggested for Johannesburg, Rio de Janeiro, Sydney (or Canberra), Paris, Rome, Berne, Stockholm, Ottawa and Tokyo. The scientists would rank as attachés with full diplomatic status. To be able to contemplate the supply of experts on so large a scale shows the great reserve of scientists on which America is able to draw. While our own scientific people could render at least as useful a service in the ambassadorial rôle, their numbers

are barely sufficient to meet the pressing need to increase teaching and research staffs, while the current requirement of more scientific liaison officers for service throughout the Commonwealth is not yet satisfied. The last is one of the topics which the Parliamentary and Scientific Committee is to study at its meeting on Monday next.

Neglected Energy?

IF any good can come out of the fresh burden of tax on hydrocarbon oils—other than to the Treasury—the most hopeful prospect may well be the powerful incentive there is now to improvise to replace the costly materials in the fields of solvents and fuel. Supplementation and substitution were among the themes dealt with by Dr. Roxbee Cox, speaking recently in London to the Institute of Metals on the special problems of operating the gas turbine on the various possible "substitute" energy raisers, natural and blast furnace gases and the products of underground coal gasification. He may have reminded many—although he did not call attention to it—of the possible fuel yields in gas of high calorific value obtainable from sewage sludge. The practicability of that is vouched for by the fact that at least 40 German towns before the war were making profitable use of that unconventional fuel. The only English parallel which comes readily to mind is the Surrey sewage authority which was recently operating its motor transport on fuel from the same source. The system as practised in Germany had the great merit of comparative simplicity, the collection of sludge in "ageing chambers" requiring heat only if rapid fermentation and correspondingly quicker yields of gas, 75 per cent of which was methane of high calorific value, was required. The inoffensive waste of that process was not deprived of its value as fertiliser. The continued "dumping" of ordinary sewage sludge, in this country at least, seems like a form of fuel improvidence to which some attention could profitably be given at the forthcoming World Power Conference.

The Phosgene Risk

THE fact that phosgene may develop when carbon tetrachloride is used as a fire extinguisher is a scientific fact which a number of alarming occurrences have fully confirmed. That knowledge alone is, however, no adequate safeguard, as a recent laboratory fire in Manchester confirmed. Aluminium powder and magnetic iron oxide in an open container were being raised to a high temperature in an electric laboratory oven when the mixture fired and started to burn with approximately the intensity of the thermite reaction. On application of the CCl_4 extinguishers, the characteristic smell of phosgene was detected and nine persons were sufficiently affected to require hospital treatment. In the intense heat developed by the burning mixture (approximately 2000° C.) it is possible that the CCl_4 reacted with the atmosphere to produce a small quantity of $COCl_2$. A possible reaction is: $CCl_4 + H_2O = COCl_2 + 2HCl$. As a result of the fire the refinery concerned (Manchester Oil Refinery, Ltd.) has withdrawn all the CCl_4 extinguishers from its plant, replacing them by CO_2 extinguishers, either the small hand instruments type or the larger mobile type. Foam extinguishers were already part of the equipment, but additional 2-gallon foam extinguishers and 18-gallon foam engines have been installed. It is a welcome recognition of the continued seriousness of accidental ignition risks that the study of fire hazards will be given prominence in the discussions at this year's chemical safety works conference at Scarborough in September. Dr. J. B. Firth, of the North-Western Forensic Science Laboratory will deliver a paper on investigations of the cause of a fire.

Better Coal Output

Britain's deep-mined coal production in the week ending June 10 amounted to 4,010,400 tons. This compared with an average of 3,981,600 tons for the first 23 weeks of the year. The lower output of the previous week, 3,089,800 tons, was accounted for by the Whitsun holidays.

ATOMIC ENERGY DEVELOPMENTS

Harwell's Increasing Contributions to Nuclear Physics

THE increasing influence and activities of the Atomic Energy Research Establishment at Harwell are reflected in its organisation of an international nuclear physics conference to be held at Oxford from September 7-13.

The main sessions will be held in the lecture theatres of the Clarendon Laboratory, delegates being limited to about 200, and attendance will be by invitation only. Representatives are expected from the U.S.A., the British Commonwealth, Western Europe, and British universities working in this field.

The conference will be divided into two parts, the first concerned primarily with the use of high energy particle accelerators, for nuclear physics experiments, and the second with lower energy nuclear physics, including the use of atomic piles for experimental work.

Conference Discussions

Subjects to be discussed on September 7 and 8 will be high energy accelerators, experimental and theoretical high energy physics and beta-ray spectroscopy. On September 11 and 12 nuclear physics will be the subject and on the closing day, September 13, pile physics and neutron spectroscopy will be discussed.

The programme includes a visit to the Atomic Energy Research Establishment on Saturday, September 9.

Among the recent developments at the AERE, Harwell, is the completion of a second electromagnetic isotope separation plant, and the collection of separated or enriched isotopes has begun.

A Press note from the Ministry of Supply notes that a small electromagnetic separator has been running at Harwell for two years and has been supplying samples of isotopes of light elements for nuclear physics work.

The new plant, which is capable of separating for experimental work gram quantities of the isotopes of the heavy elements, including uranium, at a high degree of enrichment, was designed by a group of scientists at Harwell and manufactured by Metropolitan-Vickers Electrical Co., Ltd., in conjunction with the General Electric Co., Ltd., and British Thomson-Houston, Ltd. The first separations were carried out in May.

While the large e.m. plant is expected to be fully occupied on work for the establishment for some time to come, milligram samples of the lighter elements made by the smaller plant will be made available for export, as well as for use in Britain.

Radioisotopes produced in atomic piles have by now become quite familiar. In addition most naturally occurring elements consist of a mixture of isotopes (that is, atoms of different weight but chemically identical) although few of these naturally occurring isotopes are radioactive. Their separation is difficult because it depends on small differences in physical characteristics between the isotopes.

Several methods of separation can be used, for example, diffusion, fractional distillation and the electromagnetic plant. Most methods only increase slightly the concentration of the isotopes in a single operation and the process has to be repeated in many stages to get a high enrichment.

The advantage of the electromagnetic method is that, although only small quantities are produced, a high enrichment can be obtained from a single stage.

The electromagnetic separator works in this way. A beam of ionised atoms is projected into a magnetic field. The magnetic field causes the atoms to travel in a circular path. The diameter of the path depends on the weight of the atoms so that the heavier ones travel in a wider diameter circle than the lighter ones and can be collected separately.

Sharing Atomic Development

PROFESSOR Niels Bohr, Danish physicist and Nobel prize-winner, who was engaged in atomic research in Britain and the U.S.A. during the war, last week addressed an open letter to the United Nations. In this letter, which was shown to Danish and foreign Press representatives, the professor appealed for open dissemination of information on atomic energy as a means of relaxing international tension.

Dr. Charles Allen Thomas, vice-president of the Monsanto Chemical Company, is reported to have made the proposal that industry in the U.S.A. should be allowed to build and manage its own atomic power plant with Government-leased uranium. The doctor suggests the building of a $35 million power plant of 75,000 kW in the mountains of Idaho which are rich in phosphates but scarce in power.

BASIC CHEMICAL TOTALS IN MARCH

Larger Consumption, Production and Stocks

MARCH levels of production in basic chemicals and non-ferrous metals were generally higher than in the same month of last year. Although consumption was greater in most cases, stocks also improved. Exceptions were molasses, industrial alcohol and sulphur, stocks of which were reduced.

Estimated numbers employed in the chemical and allied trades for March (in thousands) were 443.7, being 11.7 more than the corresponding period of 1949, and 1.7 fewer than February this year. Distribution of workers was as follows: coke ovens, chemicals and dyes, explosives, etc., 256.5 (188.5 men, 68.0 women); paints and varnishes 38.1 (27.1 men, 11.0 women); oils, greases, glue, etc., 67.2 (53.9 men, 13.3 women); pharmaceuticals, toilet preparations, etc., 81.9 (42.6 men, 39.3 women).

These figures and the table below are abstracted from the *Monthly Digest of Statistics*, No. 53 (HMSO, 2s. 6d.).

	March, 1950 Thousand Tons			March ,1949 Thousand Tons		
	Production	Consumption	Stocks	Production	Consumption	Stocks
Sulphuric acid	162.7	168.0	—	144.9	156.0	—
Sulphur	—	31.3	66.0	—	26.0	69.9
Pyrites	—	19.6	75.0	—	20.8	74.0
Spent oxide	—	17.9	182.4	—	16.3	168.9
Molasses (cane and beet)	9.0	41.1*	227.6	9.5	20.9*	265.8
Industrial alcohol (mil. bulk gal.)	2.69	2.75	0.61	1.44	2.12	5.6
Ammonia	—	7.15	5.58	—	7.08	5.21
Superphosphate	21.3	36.1	—	22.2	37.2	—
Compound fertiliser	221.3	353.0	—	186.8	288.3	—
Liming materials	—	460.4	—	—	466.1	—
Nitrogen content of nitrogenous fertilisers	23.59	31.78	—	21.77	24.47	—
Phosphate rock	—	96.2	212.6	—	99.8	147.0
Virgin aluminium	2.66	14.6	—	2.78	16.1	—
Virgin copper	—	32.0	115.9	—	34.2	99.4
Virgin zinc	7.10	21.7	45.1	6.26	19.6	41.6
Refined lead	8.16	13.2	64.6	5.82	12.8	26.4
Tin	—	2.82	—	1.28	2.46	21.0
Zinc concentrates	—	15.0	64.0	—	14.5	30.5
Magnesium	0.28	0.28	—	0.29	0.23	—
Pig iron	187.0†	146.0†	499.0	179.0†	140.0†	246.0
Steel ingots and castings (including alloys)	330.0†	—	1,280.0	313.0†	—	1,031.0
Rubber: Reclaimed	0.62	0.61	2.39	0.44	0.43	4.0
Natural (including latex)	—	4.72	42.9	—	4.28	47.5
Synthetic	—	0.06	0.93	—	0.05	1.87

* Distilling only. † Average of five weeks.

NHS Stimulates Pharmaceutical Sales

THE influence of the operation of the National Health Service on the demand for pharmaceutical products in the domestic field, which continued to increase, was referred to in the report for 1949 of the director of The British Drug Houses, Ltd. The overall margin of profit on that side of the company's business was stated to be narrow, but the turnover represented a large percentage of the total trading. Any substantial change in Government policy could result in serious consequences for the company and for the industry as a whole.

Whatever economies in the National Health Service might be instituted, they could hardly be at the expense of the use and development of therapeutic agents that were the outcome of scientific research. Those were essential in the treatment of disease and, in addition, were an important factor in the country's export drive. It was this type of product that the company's pharmaceutical business was mainly concerned.

The company records that during the year under review it introduced, *inter alia*, a new product, Anacobin, the first preparation of pure vitamin B_{12} to be issued by a British manufacturer. In the laboratory and fine chemical field, new processes had been worked out which had led to the production of substantial quantities of certain fine chemicals for industrial use that were formerly so expensive as to be regarded as laboratory reagents only.

PIONEERS OF CHEMICAL INDUSTRY

Achievements of a Century Recalled at Widnes

THE contribution made by chemical industries to the growth and well being of communities was exemplified last week on Merseyside when the town of Widnes commemorated its centenary as a centre of chemical production.

One hundred years ago, Widnes and the neighbouring villages had a population of 2000. To-day it is a community of 45,000 owing its importance very largely to the fact that it has become the thriving centre of a chemical industry which was established by a handful of far-sighted industrialists. That work now employs 5000, about one-third of the town's working population.

The personalities and events which helped to shape Widnes' present important character have been interestingly recalled in a short history produced by I.C.I., Ltd., of which the local General Chemicals Division were hosts on June 9 at a commemorative luncheon to people prominent in Widnes and in local and neighbouring chemical industries.

That theme was presented in fuller detail and perspective by Sir Frederick Bain, M.C., deputy chairman of I.C.I., Ltd., when he proposed the toast of "The Town and Industry of Widnes" at the luncheon. The response was given by the Mayor (Councillor John Ludden).

The First Works

The I.C.I. note claims that the first chemical works in Widnes—two—were built in 1847. One, making borax and later soda, was started by a Glasgow man, John McLellan. The other, and more important, was founded by John Hutchinson (then only 25 years of age) and his partner Oswald Earle. Hutchinson's No. 1 works, as it was later called, was the first in Widnes to use the Leblanc process for the manufacture of alkali, a fact which has only recently come to light. It had long been a mistaken tradition in the town that James Muspratt, whose son had an alkali works at Woodend, founded the local Leblanc industry. In fact his works were not built until 1852.

In 1850 a third pioneer entered the field, William Gossage, who erected a small soda works on the other side of the Widnes-St. Helens Canal.

By 1850, Hutchinson was employing about 100 men in No. 1 works, Gossage was operating in a small way, and McLellan was making borax at his North British Chemical Works. It is reasonable, therefore, to date the beginnings of the Widnes chemical industry from this year, although strictly it might be taken as beginning in the summer of 1847, when Hutchinson's No. 1 works were erected.

Sir Frederick Bain

Another important works was started in 1853, when Hutchinson's works manager, Henry Deacon, broke away and formed a partnership with William Pilkington. Deacon wanted to exploit the ammonia-soda process instead of the Leblanc, and quarrelled with his partner.

Deacon then entered into partnership with Holbrook Gaskell, who insisted on using the conventional Leblanc system. The present Gaskell-Marsh group of works of I.C.I. General Chemicals Division stands on the site of Deacon's original factory.

Hutchinson and the other soda manufacturers improved and elaborated the original Leblanc process, and it became the basis of the heavy chemical industry. Twenty years after Hutchinson built his factory, the population of Widnes had risen to 14,000; within another 20 years this figure had been doubled. Salt from Cheshire, pyrites from Ireland and Spain, and limestone from Derbyshire, Cornwall and Wales poured into the Widnes factories to be transformed into chemicals. The picturesque signs with which the Widnes chemical manufacturers labelled their casks and carboys—the bull, the

kangaroo, the thistle and the skull and crossbones—all became familiar sights in the industries of this country, on the Continent and in America.

But Widnes was not only manufacturing chemicals. In 1891, the United Alkali Company, a firm which by that date embraced most of the chemical manufacturers in Widnes, set up in the town the first industrial research laboratory in Britain. Men such as Deacon, Gossage, Hargreaves and Hunter established a tradition of industrial investigation, and from their research came new processes, some still used to-day, for manufacturing soda, chlorine and caustic soda.

The Widnes research laboratory, now the main laboratory of the General Chemicals Division of I.C.I., has many notable achievements to its credit, and for over 50 years it has been the hub of the local heavy chemical industry.

Chlorine Products

It assisted in the change-over from the Leblanc soda processes to the modern production of chlorine by the electrolysis of salt—a revolution in chemical manufacture—and in the development of the many organic and other products now derived from chlorine.

The laboratory played a vital part during the second world war. It took a large share in research connected with all forms of chemical defence and developed and operated processes by which the nation was kept supplied with many key chemicals. It is public knowledge that part of the Widnes staff was intimately engaged in atomic research during the war. Widnes made outstanding contributions to the production of uranium metal and of uranium hexafluoride, and helped to lay the foundation of the analytical chemistry of uranium.

Here also, during the war, the vinyl chloride process was developed to provide a substitute for rubber. At the same time work was going forward on two of the greatest chemical developments—Gammexane and Methoxone. Both are manufactured on a large scale in Widnes to-day.

More recently the laboratory has worked on the fluoro-chloromethanes, previously imported under the name of Freons; which have produced radical alterations in methods of refrigeration, and are now being produced on Merseyside under the British name of Arctons. Yet another postwar product of the Widnes Laboratory is the unique plastic, polytetrafluoroethylene. The laboratory is producing this, as Fluon, on a semi-commercial scale.

The personalities of the early leaders in chemical production in Widnes and the times in which they lived were vividly recalled by Sir Frederick Bain. He welcomed the guests on behalf of the General Chemicals Division of I.C.I. and expressed the regrets and apologies of the chairman, Lord McGowan, for his absence.

In the course of his speech, Sir Frederick Bain said :—

It sometimes seems that this present time is one of the most disturbing and dangerous periods through which the world has passed. But I dare say that those who lived around the turn of 1850 and were alive to affairs thought pretty much in the same terms as we do to-day.

In 1847 Russia absorbed Poland; there was war in Switzerland. In 1848 there were revolutions in Paris, Berlin, Vienna, Sicily. Austria was at war with Sardinia. Prussia invaded Denmark, the Pope was forced to flee from Rome and in this country the Habeas Corpus Act was suspended. We were fighting the Sikhs at Chillianwallah and Gugerat. In 1850 the British blockaded the Piraeus to avenge an assault on a British subject, whose name, strangely enough, was Don Pacifica. The writ of Britain ran far in those days. But let us remember that those same years saw the burgeoning of genius in Tennyson, the Brontes, Dickens and Thackeray.

A Toronto paper, *The Examiner*, printed exactly a hundred years ago a passage which is an admirable illustration of the truth of the old French saying that " the more things change the more they remain the same." " Russia, the empire which subsists on the most rude and naked basis of main force is the great depository of warlike menaces; and the advance of her encroachment has now reached such a point that the next step seems certain to involve Europe in a war of resistance. . . ."

Benefits of Industrialisation

We live in an age when it is claimed that events have become so huge and complex that men no longer have the individual significance they had in former days. This is a view of our contemporary situation that I reject utterly. By no means let us forget that the early history of industrialism had its wrongs, its shocking wrongs of child labour, filth and preventable disease. But let us not forget, also, that these wrongs were remedied, while the benefits of industrialisation remained, and are with us now.

It was glass that brought light into human homes; plumbing, soap and chlorine, health and length of days; the

textile industries, and a host of others, that brought beauty and dignity. The chemical factories may have appeared satanic enough—certainly they were no garden of roses—but the men who established and developed them bear no whit of resemblance to the grasping ogres of the conventional picture of industrialists in the past. They lived and toiled on the scene of their enterprises; the contributions they made in leadership and inventiveness were personal ones, they were the visible captains in the field of battle.

Of the date of Hutchinson's arrival in Widnes there is no doubt. He established his No. 1 works at the mouth of what is still called the " New Cut " in the summer of 1847. In the course of a year or so he was employing more than a hundred men there in the manufacture of soda by the Leblanc process; the chemical industry history of Widnes had begun. John Hutchinson was a remarkable personality. With no inherited wealth, with not more than a matter of a few months experience in the manufacture of alkali, at the age of 25 he was owner and manager of his own factory. One might ask where is the young man today who would embark on such an enterprise? Have times so changed or are our young men less adventurous?

Hutchinson's first and prudent object was to have somewhere to dump the rapidly accumulating waste from his factory; this waste, he foresaw, would become an increasing embarrassment to himself and to future alkali-makers in the area. But the plan for which Hutchinson deserves most credit for conceiving was that of cutting a dock and laying down a system of private railways to serve the future industries which he, quite rightly, expected would develop in the town. John Hutchinson, more than 90 years ago, planned one of the first " industrial estates " in the country. After his death in 1865, it was round his dock and on his shrewdly acquired land that the second great development of Widnes chemical industry took place. His foresight was amply justified by events.

Great Leaders

Sir Frederick Bain went on to refer to other great leaders of Widnes chemical industry. William Gossage, who went to the town in 1850, established there a world-famous soap industry. Henry Deacon, he recalled, went to Widnes as John Hutchinson's first works manager, and eventually devised, with Dr. Ferdinand Harter, the process for the manufacture of chlorine, which practically held the field until the second decade of the present century. James Muspratt, in 1823, was the beginner of a long family connection with the Widnes chemical industry, being eventually succeeded by his sons Frederic and Edmund Knowles Muspratt. The last named's son, Sir Max, in later years became chairman of the United Alkali Company.

From 1847, for almost 20 years, McLellan, Hutchinson, Gossage, Muspratt, Gaskell and Deacon were the only names in the Widnes chemical industry. Their enterprise built up the tradition of this industry in the area, and, during the great commercial spurt of the 70's other industrialists made Widnes the site of their undertakings. Today Widnes is still proving a magnet for new chemical developments. Ludwig Mond, writing to his parents in 1872, said of Widnes, as he knew it, that " There is nowhere in the world where a factory could be set up with such ease and small capital, and where such working power can be found. . . . "

The Alkali Industry

In these cautious days it seems almost absurd that a youngster with a few months' experience of industry and with a half-conceived process in his pocket—along with a handful of paternal florins—should seek to storm the gates of the British alkali industry, and—more amazing still—that he should succeed. For ten years Mond made Widnes his headquarters; it was here that he established his home and it was in Widnes that Alfred Mond, the first Lord Melchett, was born. It was here that Ludwig developed his sulphur recovery process—the first solution of the problem that was finally to be solved by Chance of Oldbury. But let us not forget that it was John Hutchinson who had the insight to realise that Ludwig Mond, the enthusiastic young man from the Continent had a worth-while idea and the ability to carry it to fruition.

But there have been giants nearer to our own time to whom credit must be given. Sir Max Muspratt, Sir Christopher Clayton, John A. E. Rayner and Sir Holbrook Gaskell, are names honoured and respected in Widnes today, and I wish to pay tribute to those who, still in active service, have given, and are continuing to give, of their best on behalf of our industry in this town. We salute the thousands of devoted people who have made the working population of Widnes.

In the chemical industry there is no resting on established process and routine, and the hereditary skill of the Widnes chemical worker will ensure the continuing development of the industry in this town.

THIRD SAFETY CONFERENCE

Varied Scarborough Programme

SAFETY in chemical works will again be the subject of a conference to be held at Scarborough. The discussions, organised by the Association of British Chemical Manufacturers and the Royal Society for the Prevention of Accidents, will take place from Friday, September 29, to Sunday, October 1, under the chairmanship of Mr. J. Davidson Pratt, director, ABCM.

Proceedings will begin on Friday evening with a short introductory address by Prof. D. M. Newitt, president of the Institution of Chemical Engineers, who will be followed by Mr. J. Eyers (Vulcan Boiler & General Insurance Co., Ltd.), with a paper on "Safety in the Services Department."

Speakers on Saturday morning will be Mr. M. E. E. Chanter (Shell Refining and Marketing Co., Ltd.) "Fire Hazards and Precautions in the Petroleum Industry"; Mr. J. Howlett (The Distillers Co., Ltd.): "Fire Hazards and Precautions in the Manufacture and Use of Solvents"; and Dr. J. B. Firth (North Western Forensic Science Laboratory): "Investigation of the Causes of Fire." The evening will be devoted to a Brains Trust, with Mr. H. R. Payne (I.C.I., Ltd.), as quiz master.

The final session on Sunday morning will deal with fusion welded pressure vessels. Mr. W. E. Chipperfield (Babcock & Wilcox, Ltd.), will express the manufacturers' point of view and Mr. J. W. Strawson (Shell Refining and Marketing Co., Ltd.) will speak from the point of view of the user.

Linseed Oil Allocations Ended

AS a result of the improvement of supplies, the present allocation scheme for linseed oil will be discontinued from July 2. From that date supplies of raw oil will be made available to processers and other direct buyers. Manufacturers requiring supplies of processed oil should place their orders direct with a processer in the ordinary way of business. No permit will be needed to buy processed oil.

Applications should be made to the Ministry of Food, Oils and Fats Division at least one week before the end of each month (beginning with June) for the quantities of raw oil required during the following month, by processers and other direct buyers, including oil to be shipped with paste paint. The proportion of oil which may be shipped with paste paint will continue at the present rate of one part of oil to two parts by weight of paste paint.

STRUCTURE OF PROTEINS

Tests by X-Ray Crystal Analysis

ONE of the greatest unsolved problems in the borderland of biology, chemistry and physics is the structure of proteins. It was only during the last 40 years that it had come to be realised that proteins were built up of particles possessing individuality and were really giant molecules, according to Dr. John Iball in his lecture on "Some Physical Properties of Proteins" delivered to the Royal Society in Edinburgh last week.

The main advances made during the last few decades had been as a result of the application of physical and physical-chemical methods.

Proteins, he said, possessed astonishing variety but it was originally considered that they could be roughly divided into two classes, according to their distribution in the organism and their physical character. The application of X-ray crystal analysis had revealed more and more of their structural characteristics and it was now seen that these two classes were probably different manifestations of some more fundamental structural pattern.

One of the most remarkable properties of proteins was revealed in the fact that, to give only one example, hæmoglobin from one species of animal was quite distinct from that from another species and yet there were often no conspicuous chemical differences.

These differences from species to species which formed the basis of blood groups and immunisation could be shown to persist when we changed the form of a protein molecule from a compact globular shape to a thin flat film only a few atoms thick.

"Egg" Albumin from Fish

ANOTHER process for the production of albumin from fish (THE CHEMICAL AGE, *62*, 528) is reported from Norway, where scientists claim that they are now producing it on a commercial scale in a form equivalent to white of egg. Trial production, by what is stated to be a completely chemical-mechanical process, now reaches 600 lb. of dried "egg white" a day. A weight of 10-12 lb. of fish waste is required to produce 1 lb. of the finished article, which is usable for the making of ice cream, puddings, soup powder, etc. The product intended for human consumption will be priced at 5s. to 7s. per lb., but the commercial product will be less refined and correspondingly cheaper.

CONTRIBUTIONS OF A LEATHER CHEMIST

Recollections of Advances in Process Developments

TYPICAL examples of the service being rendered by chemists to facilitate and improve the processes of leather manufacture have been described by Mr. R. Faraday Innes, speaking in London on June 9 to the Society of Leather Trades Chemists.

Recalling his 48 years in chemistry, on the eve of his retirement, Mr. Innes made clear that modern leather processes owe a large debt to the chemist's substitution of certain materials in tannage and particularly the study of water treatment.

Mr. Innes recalled that during the early stages of his service in Northampton, with the British Chrome Tanning Company and others, greasy backs were a great nuisance, and up to 30 per cent of the skins had to be degreased before seasoning and glazing was possible.

This in time was traced to the use of D/S skins in which staling had produced free fatty acid. It was not due so much to a high fat content, which was seldom more than 5 per cent, on the dry weight, but to the free fatty acid which was converted to lime soap and then to chrome soap in the process work. The chrome soap had high absorptive powers for neatsfoot oil, which was taken up preferentially in the affected areas.

Source of Leather Defects

Mr. Innes advocated a full pickling followed by treatment with white spirit, and although goatskin tanners said that the job was not worth it, he believed that improvements in the levelness and brightness of dye and finish, and the consequent upgrading of the product, would more than compensate for the cost. He maintained that many minor troubles due to this cause could be ascribed to greasiness.

The hardness of the water at Northampton (60 parts per 100,000) caused much trouble, but two 10,000 gallon tanks were installed in which the water gas softened by the addition of the calculated amount of lime and soda, followed by plunging and settling. This reduced the hardness to 5 parts per 100,000. Previously the Lancashire boilers had to be scaled three or four times a year when two men would work for four days chipping off the $\frac{3}{8}$ in. layer of scale with hammer and chisel. Afterwards even old scale would gradually soften and fall. Such scale could increase fuel consumption by about 50 per cent, which would mean considerable expense on a use of 1,000 tons a year.

Other troubles, however, followed from the use of this water. Investigations showed that the reaction between the permanent hardness salts and the chemicals was very slow, but that less alkali need be used if the water were first heated and then allowed to stand. The alkalinity of the water, in the region of *p*H 10 or more, was too high to allow the enzymes to work, though it allowed the pelts to get blown grain. The difficulty was avoided by using separate water reduced to about 10 degrees of hardness without the use of soda.

Differing Results

Mr. Innes gave an instance of leather from similar raw materials produced respectively in Northampton and Worcester, where the latter product was softer and fuller than the former, which, though good, was much firmer. Microscopically, the first showed much greater separation or differentiation of the fibres into fibrils.

The Northampton water came from a well under the cattle market and, although containing 2 parts per 100,000 of ammonia as well as nitrates and nitrites (signs of heavy sewage contamination) had less than 1000 bacteria per c.c. when drawn, and that proportion was reduced on keeping.

Severn water, however, contained only the ordinary salts, but had a bacterial count of 100,000 per c.c. which rose enormously on standing. There were many liquifying and fluorescent bacteria. When tested by enzymatic digestion of gelatin by Wood's method, the Northampton water was found to be free of tryptic enzymes, of which the Severn water contained a considerable amount.

In conjunction with chemical analyses it did seem that the bacterial flora and not the salt content was the important point.

A surprising result followed the sinking of a well 173 ft. deep at Northampton, as the water delivered at 53° F. all the year round had a total hardness of only 1 part per 100,000, and was in fact a natural zeolite water equivalent to N/100 sodium bicarbonate solution.

The rotting of leather and the means of protection against it had often been discussed before, but the latest work rounded off the story. Red rot occurred when vegetable leather contained 5-7 per cent

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WAX AND TANNIN FROM WASTE BARK

Rapid Solvent Extraction in the U.S.A.

A THREE-YEAR investigation by the Oregon Forest Products Laboratory has provided evidence that wax and tannin can be produced from Douglas-fir bark. The bark, which hitherto had been used for fuel, or discarded, is available in large quantities from the pulp and paper, pole and piling and plywood industries. This research and some quantitative results are summarised in a current U.S. report (*Chemical Engineering News*, 28, 20, 1656). Douglas-fir bark contains about 5-10 per cent of a hard, non-tacky wax, of which about two-thirds is soluble in petroleum derived solvents, and the remainder in benzene or the chlorinated aliphatic hydrocarbon-type solvents. Experiments showed that wax could be extracted from moist bark in about 3 hours, with nearly complete recovery of solvent.

The hexane-soluble wax fraction is light in colour, melts at 140°-145° F., and is composed of lignoceric acid, ferulic acid (4-hydroxy-3-methoxycinnamic acid) and lignoceryl alcohol largely combined in the form of esters.

The benzene soluble portion is brown in colour and of a more complex chemical nature. It also melts at 140°-145° F.

Douglas-fir tannin, suitable for leather manufacture, has been obtained in yields of 8 to 18 per cent, based on the dry weight of sound bark, and is present in the bark from young second-growth trees and the top bark from older trees.

Laboratory studies made in the past year have shown that tannin can be leached easily from the bark with hot water in wooden tanks, which are arranged to give a counter-current extraction operation. About 6.5 parts of water to 1 of moisture-free bark was required. Between 85 and 100 per cent of the tannin extracts were concentrated to 50 per cent total solids content in a vacuum evaporator and dried without loss of tannin by conversion to insolubles.

The extraction of wax and tannin can be combined advantageously into a single operation, but an adverse factor is that bark with the highest tannin content has the least amount of wax. For best results bark from both young and old trees should be used.

First results of extraction of wax give an output of about 120 lb. per ton of oven-dry bark. In addition, Douglas-fir bark has been found to contain from 5 to 8 per cent of dihydroquercetin which may be of use in medicine.

CONTRIBUTIONS OF A LEATHER CHEMIST

(*continued from previous page*)

by weight of sulphuric acid, which could accumulate in a few years in industrial atmospheres, though the conversion of atmospheric sulphur dioxide to sulphuric acid took place only in foggy conditions.

The conversion of atmospheric sulphur dioxide to sulphuric acid in the leather was due to the presence of small traces of iron in an ionised form. If leather spectroscopically free from iron was exposed to sulphur dioxide it did not rot. Air free from sulphur dioxide occurred only where wood and not coal was burned. When sulphur dioxide and the particular iron compounds were present, rotting would occur in about four years.

If, however, the iron was converted into an un-ionised form, there was no catalytic oxidation of the sulphur dioxide, and no rotting. The best salt for looking up the iron in un-ionised complexes was sodium pyrophosphate. Exhaustive gas chamber tests upheld this claim, so that the work started by Faraday at the Athenaeum in 1843 could be considered completed.

[Mr. Faraday Innes began his training in 1902 and served with the British Chrome Tanning Company in Northampton from 1912-1920. He has since been intimately associated, since 1921, with the research of the British Leather Trades Research Association].

Canadian Trade Fair

A FEATURE of the third Canadian International Trade Fair which closed in Toronto last week has been the success of British firms, especially the British Tool, Machine Tool and Scientific Instrument section which occupied 75 per cent of the floor space. Original exhibits in this section included a telescope fitted with an extra lens which when swung in front of the fixed crystal converted it into a microscope; a 19-centimetre high temperature powder camera capable of taking X-ray analysis up to 1000° C., and micrometers fitted with Braille markings for the use of blind workmen.

HIGHER FERTILISER PRICES

Possible Effects of the New Schedule

THE imminent sharp rise in prices of chemical fertilisers will be the first really substantial change in some 30 years. If the ups and downs of the war and post-war period in War I are ignored, the general increase of about 25 per cent, which comes into effect on July 1 represents in fact the first large rise for more than half a century. These changes are the result of the removal of subsidy, the first stage of which has been scheduled to take place on July 1 this year. For some months the industry and its consumers have been held in suspense, knowing that there would be seriously large changes on that date but not knowing how much de-subsidisation would take place on this date and how much would be left until the second and last stage, July 1, 1951.

It is not irrelevant to recall the history of the fertiliser subsidies. They began to accumulate early in the war. Farmers were asked to produce more food and maximum prices for crops were fixed; they were given a promise that fertiliser prices would be kept at their then current levels. Maximum control prices were therefore imposed.

Rises in such raw materials as phosphate rock, potash, sulphuric acid, were met by increasing subsidies; Government departments were in any case acting as both buyers and sellers of basic raw materials in many cases. Rises in labour, bagging, transport, and general factory costs were balanced by direct subsidy allowances to fertiliser manufacturers. At no time since approximately 1940 has a farmer paid the real cost price for a load of mineral fertilisers.

Controlled Selling Prices

Since the end of the war, these somewhat invisible subsidies have gone on steadily increasing, while the controlled selling prices of fertilisers have stayed practically unchanged. Now these economic buttresses, which have taken 10 years to reach their present size, are to be removed in two stages. The steep price rise this summer will be followed by another rise next summer.

In retrospect, it appears unfortunate that some proportion of the rising costs of fertiliser manufacture was not passed on, year by year, to the farmers. The original promise that fertiliser prices would not rise at all was equivalent to a blank cheque, an ill-conceived piece of assurance.

Fertilisers were exceptionally cheap from about 1922 to 1939. To freeze their prices at these levels during a decade of unprecedented agricultural expansion was certainly an example of "feather-bed" economics. The result is that now on July 1 the exchange of the feather-bed for a relatively hard pallet is going to be severely felt by many farmers, especially the smaller ones.

Psychologically there is another matter for regret. In the whole ten years of the subsidised period very few buyers of fertilisers have been aware that these commodities have been subsidised at all. Neither the Government nor the industry had, until recently, drawn much attention to this important fact. The consumer had had little chance to be fore-armed by knowledge of the facts.

Compound Fertilisers

Superphosphate will rise by £1 17s. 6d. per ton; sulphate of ammonia by £2 6s. 6d.; muriate of potash (60 per cent grade) by £2 10s. These fertilisers are, of course, the "Big Three." Not only are they considerably used separately but they are the dominant ingredients of compound fertilisers. Compound fertilisers will rise by about £3 per ton, though the actual rise permitted varies slightly with analysis. Broadly speaking, the price addition is one of 25 per cent.

What will be the effect upon fertiliser consumption? Clearly, if all farmers decided to spend no more per year upon fertilisers, there would be a drop in tonnage of 20 per cent; 10 tons at, say, £10 will cost the same as 8 tons at £12 10s. A fall in demand of some 20 per cent is the worst that can happen in the coming agricultural year.

A reduction on this scale is fortunately most unlikely. On most of our large arable farms fertilisers are indispensable for the maintenance of economic cropping levels; these farms could economise on fertiliser purchases only by reducing cropping acreage, not by reducing their rates of application per acre. It is only on the small mixed farms that proportionately large economies may be expected. On the other hand, cattle feedingstuffs have already been de-subsidised and the prices of these commodities have risen even more sharply.

Farmers whose main interest lies in producing milk or meat must turn increasingly

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Clarifying Agents

Observations by a New Wine Group

MUCH practical experience in the use of clarifying agents, notably casein and bentonite, in the preparation of wines has been condensed in the first publication, in Argentina, of the journal of the recently formed Wine Institute. This is a section of the agricultural science department of the National University of Cuyo.

Volume 1, No. 1 of *Anales del Instituto del Vino* contains articles on the use of casein in the clarification of white wines, by A. Maveroff (director of the institute); enzymes in the clarification of musts, by J. Testa and A. Maveroff; clarifying and stabilising action of bentonite in wines, by P. G. Garoglio and A. Maveroff.

Use of Casein

In the study of casein it is concluded that one advantage of its use for white wines is the absence of over-clarification. It must, however, be mixed immediately in the whole batch of wine because of rapid coagulation.

Sodium caseinate appears to give the best results in 0.5 per cent solution. The *p*H range in the tests was 2.7 to 5, and 4.7 appears to be about the best, but normal variations do not appear to have much effect.

The authors agree with earlier workers that the addition of tannin has little or no effect. Some attention has been devoted to its determination and dosage in wines. Temperature is less important when using casein than with other clarifiers, but a fairly low range, below 16°C. is preferable. Casein appears to be advantageous also in eliminating iron, or reducing the iron "break."

The observations on the use of bentonite as clarifying agent indicate that it has proved particularly effective in the removal of protein matter and some of the iron; but it is pointed out that the present tests were entirely in the laboratory; large-scale work may require some modification. Some conclusions however were definite and reliable.

The bentonites used were of native origin, from Cuyo, the general qualities of which have been described, and their preparation, either in the form of fine powder or as suspensions, aqueous, acid, or alkaline, or in wine or alcohol. It is preferably used as fine powder and vigourously stirred in.

Degree of Concentration

In aqueous suspensions the best concentration is 5 per cent, and for fine powder 0.5 to 1 g. per litre. A temperature range of 1° to 22°C. was used, but it was mainly in iron elimination that the lower temperatures proved advantageous. The temperature factor is not of fundamental importance, and much the same may be said of *p*H. No obvious advantage was gained with either acid or alkaline suspensions. The action of bentonite in iron elimination is not clear, but it is probable that oxide reduction is stimulated by the bentonite and the iron present is converted to phosphate and more readily precipitated.

HIGHER FERTILISER PRICES

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towards home-grown fodder, to cereals, lucerne, clovers, and particularly to grass. They cannot produce more of these crops without considerably increasing their use of fertilisers. Moreover, there is to be a new subsidy scheme to encourage the increased application of fertilisers to grassland; this will be paid directly to farmers in the form of a proportion of their costs for such applications.

Despite this abrupt price rise, the prospects of the fertiliser industry can still be considered to be good. A gradually rising consumption by grassland farmers will compensate any immediate decline in consumption on the small mixed farms and should in time build up to a very large total tonnage. On the large arable farms there will be little or no reduction in demand. The 1950/51 agricultural year may be one of adjustment and "standstill" so far as total consumption is concerned, but an appreciable drop in tonnage is most unlikely.

A more serious threat to the continued expansion of the fertiliser industry is represented by the further rises in raw material and manufacturing costs. To stabilise those at a reasonable level is more urgently necessary than to safeguard the current scale of consumption of the finished materials.

ADVANCED RUBBER RESEARCH

Wide Field of New Dunlop Centre

THE chemical research work undertaken at the newly opened Dunlop Research Centre includes fundamental studies as well as investigations directed towards improvement in manufacture and development of new processes and products. The wide field covered includes the chemistry not only of rubber and allied substances such as synthetic polymers and plastics, but also that of many other materials.

These include natural and synthetic textiles, surface-active agents, bactericides and fungicides, surface coating compositions, adhesives and many specific materials associated with the company's various manufactures.

Research chemistry of this type demands the most up-to-date equipment. This has been unstintingly provided in these new, very much enlarged laboratories. The staff has also been increased and facilities for these highly specialised studies thus considerably improved.

In the organic laboratories provision has been made for the fundamental study of high-polymers and their preparation by various polymerisation techniques. The polymers are evaluated in various ways including physico-chemical methods—by osmometry, viscosity, refractive index measurements and dilatometry. Much of the apparatus used in this work has been designed and constructed either in the laboratories or in collaboration with the research instrument section located in the building.

Other branches of rubber chemistry under investigation include such projects as chemical treatments for rubber surfaces, mastication and chemical plasticisation, vulcanisation and acceleration, reinforcement and reinforcing agents, oxidation and antioxidants, adhesion and bonding agents, and the chemistry of rubber latexes and derivatives. Such work is applied to both natural and synthetic materials.

The physico-chemical laboratories are well-equipped for fundamental research on such problems as surface activity, properties of the rubber particle in latex, preservation of latex and the mechanism of its coagulation.

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Intelligent distribution characterises the bench layout and design in the analytical section of the Dunlop Research Centre. Noteworthy features are the easily accessible sinks, taps and vacuum services; remote control of gas supply; conveniently situated electric points (remote from water supply) and the section for books and paper work at the end of each bench

Ceylon's New Rubber Policy

Research on Manufacturing and Seed Oil Extraction

DESPITE the fact that world rubber prices have more than doubled in the course of a few months, Ceylon's programme to intensify the fabrication of rubber goods, the extraction on a commercial scale of rubber seed oil and the local use of rubber are being actively developed. In the last two months the price of natural rubber, which averaged less than 1s. a lb. last year, has risen from 1s. 4d. a lb. to 2s. 3d. For a brief period in May it was even higher.

The aim of the Rubber Service Laboratory, established by the Ceylon Government at Katukurunda, is to do research work which will enable Ceylon to be self-sufficient as far as rubber goods are concerned. The experience gained and the methods evolved are to be made available without qualification to anybody in the island who will embark on projects that will use rubber as a base for manufacturing articles.

Assisting Manufacturers

The laboratory will, in fact, assist the trade in producing any article out of rubber, from shoe soles to highly specialised articles, including callendered and "rubber-proofed" articles. It will also evolve a grading scheme for rubber to replace the present out-moded non-technical terminology such as smoked sheet, crepe, etc.

Dr. Sunderalingam, rubber technologist in charge of the laboratory, states that the extraction of oil from rubber seed on a commercial scale will shortly begin. About 60,000 tons of rubber seed fell in a season of 60 days and went to waste, so the oil extraction will begin under the rubber trees themselves. There will be mobile sterilising units visiting rubber areas, installing themselves in rubber estates and sterilising collected seed in mobile ovens. Once that is done the seeds can be crushed and the oil extracted by any expeller. This oil cannot be used for cooking purposes as there will be about half per cent rubber in it, but it can be made edible if the solvent extraction process is adopted.

Rubber is soon to be used for surfacing the area round the laboratory and its approach roads. The process will involve the use of latex (not rubber powder) with bitumen.

The laboratory has highly technical machinery and various items of apparatus never before used in Ceylon in rubber production. Among these are a radio-form heater which heats products uniformly electronically, a resilience testing machine, and a very delicate colorimeter. There are hydraulic presses exerting 20 tons pressure with the operation of a hand lever.

New Canadian Source of Solvents

Building of an additional unit in Sarnia (Ontario) by the Dow Chemical Company of Canada is to begin at once. The $1 million plant will manufacture principally three non-flammable synthetic solvents, all of which have major roles in the dry cleaning industry and as metal degreasing solvents. Of considerable significance to the Canadian market is the fact that carbon tetra-chloride will be manufactured. This material has not hitherto been made in Canada. An important by-product of the plant will be hydrochloric acid.

ADVANCED RUBBER RESEARCH

(*continued from previous page*)

Other important investigations include the close study of the actual mechanisms of oxidation, cyclisation and plasticisation of rubber and of other processes previously mentioned. The kinetics of rubber reactions used in various manufacturing operations are also given special consideration. Miscellaneous problems include studies on synthetic plastics and resins and on lacquers and paints for use in conjunction with rubber and gutta percha.

Analytical research work is concerned with the determinations in rubber mixings, by new and improved methods, of sulphur, halogens, oxygen (directly), carbon black, plasticisers, accelerators, antioxidants, natural and synthetic rubbers, as well as many other auxiliary materials used in rubber manufacture. In this work, microchemical methods have an important place, and use is made of modern techniques such as column and paper chromatography, polarography, etc.

Separate laboratories provide scope for work with the infra-red spectrometer, Spekker photo-electric absorptiometer, ultra-violet spectrometer, and for radioactive isotope techniques.

APPLICATIONS OF VINYL BUTYRAL RESINS

Their Use as Coatings and Adhesives

From A CORRESPONDENT

VINYL butyral resins have been manufactured since 1936 and used almost exclusively for safety glass laminates. Only recently have solution grades of these resins become available in granular form for use in coatings and adhesives. Of particular importance is the development of the wash primer type of metal conditioner and wood knot sealer requiring the use of vinyl butyral resins.

Polyvinyl butyral coatings and adhesives possess a good shock resistance, excellent adhesion to glass, wood, metal, leather and most plastics, retention of colour on exposure to light and heat and outstanding toughness and flexibility. Unlike most thermoplastics, these co-polymers lend themselves to curing of cross-linking to give a surface coating that is solvent resistant, hard and possesses a higher softening point than the unmodified resin. In addition, the resistance of the coating to moisture absorption is increased and its tendency to cold flow lessened.

The degree of hardness obtained can be controlled by the selection of curing agents and by modifying the amount used. Both resinous and chemical agents can be employed, the most successful resin being phenol formaldehyde and the most effective chemicals formaldehyde and glyoxal. Vinyl butyral resins are compatible with urea and melamine resins and they can be plasticised with many commercial plasticisers, such as dibutyl sebacate. Common solvents for the resins include alcohols, Cellosolve compounds and esters.

A Stable Bond

One of the most important developments in the adhesive field is the widening use of vinyl butyral-phenolic cements for bonding rubber, cork, asbestos board, wood, glass or ceramic parts, cloth, paper or metals to plastics of the thermosetting type. After the bond has been cured, it is stable to at least 100°C. and will not be softened readily by the application of water or solvents.

In metal bonding the standard technique is quite simple. The metal parts to be bonded are first thoroughly cleaned and dried; usually solvent degreasing is advisable. Next the solvent solution of the resin is applied to the metal surfaces and allowed to dry by means of a low bake at a maximum temperature of 250°F. for five minutes. After the solvent has been completely removed, the surfaces are pressed together under light pressure and heated to temperatures varying from 275° F. to 400°F. for periods of from 15 minutes to a few seconds, depending on the heat applied.

Modified techniques are used for bonding wood to metal as high temperatures tend to limit adhesion and cause deterioration of the wood; usually air drying is preferred to stoving. For bonding plywood a good deal of attention is being given to the use of phenolic resin syrups modified with vinyl butyral resins, which have the property of increasing tensile strength and improving impact strength.

New Wash Primer Conditioner

Undoubtedly the most important application of vinyl butyral resins is for the new wash primer conditioner for metals. This primer is actually a complex resin-chromate-phosphate solution, which has excellent adhesion to clean metal surfaces and air-dries rapidly to leave a uniform protective film to which most paints and coating will adhere. The wash primer originally developed by the U.S. Union Carbide and Carbon Corporation consists of a two-container system composed of a base grind made up of vinyl butyral resin, an insoluble type chrome pigment and some of the solvent, and an acid diluent composed of phosphoric acid, water and the remainder of the solvent.

The great advantages of this treatment over the standard type of wash primer, involving the sandblasting of the metal surface and subsequent application of aqueous phosphoric acid, are that the new method can be successfully carried out at low temperatures, it ensures better adherence of paint film and enables the treated metal surfaces to be exposed to the weather prior to the application of an anti-corrosion primer.

Application of wash primer tvpe of metal conditioners can be carried out by conventional methods on clean, grease-free metal surfaces, both ferrous and non-ferrous. It is, however, necessary to alter the formulation to suit the particular metal. All types of paints adhere well to the

(*continued overleaf*)

Determination of Synthetic Methionine

Increasing Therapeutic Importance of New Amino Acid

From A CORRESPONDENT

METHIONINE, γ-methylmercapto-α-aminobutyric acid, one of the essential sulphur containing amino acids, was discovered by Mueller in 1922 in casein hydrolysates (*Proc. Soc. Exptl. Biol. Med.*, 19, 161, 1922) and given the empirical formula $C_5H_{11}NO_2S$. Its synthesis was first carried out by Barger and Coyne (*Biochem. J.*, 22 1417, 1928) by means of a modified Stecker reaction using β-methylpropionaldehyde.

Several other investigators later synthesised methionine, using improved and modified techniques. The synthesis of DL-methionine containing excess of the stable isotopes S^{34} and C^{13} in the beta and gamma positions was first accomplished by Kilmer and du Vigneaud in 1944 (*J. Biol. Chem.*, 154, 247, 1944).

Synthetic DL-methionine as at present synthesised from such raw materials as acrolein, hydrogen cyanide and ammonia is a white substance crystallising from water in lustrous white hexagonal plates. It is soluble in water to the extent of 3.4 gm. in 100 gm. water at 25°C. and 17.6 gm. at 100°C. Methionine is very slightly soluble in methyl alcohol (0.1 gm. per 100 cc. at 25°C.) and sparingly soluble in ethyl alcohol and other solvents.

The melting point of this amino acid is in the range of 268-70°C. when inserted in an open capillary tube in a bath at 240°C. and the bath temperature raised at a uniform rate of 3°C. per minute.

Methionine is indispensable in the diets of certain animals and it has been definitely established that it is the precursor of cystine which may be considered a breakdown product of methionine. The complete absence of this amino acid from the diets of experimental animals caused loss of weight, loss of hair and eventual death. The indispensability of methionine to human beings has been well established by several investigators, notably Rose, Haines, Johnson, Madden, Block, Albanese, Holt, Brumback, Franston, Jane and Irby.

Research workers of the Dow Chemical Company in the U.S.A., which produces methionine, conclude that if the average human adult daily requires 60 gm. and 50 gm. (man or woman) of a protein such as casein for the maintenance of good health, then approximately 2 gm. of methionine is required. In deficiency disorders and metabolic dysfunctions, higher quantities of methionine may be necessary.

Medical Uses

Methionine is of importance in the treatment of hepatic diseases and remarkable success has been achieved when both choline and methionine were intravenously injected into a patient who had severe heptatorenal injury as a result of large doses of barbiturates (Barclay and Cooke, *Lancet*, 2, 458, 1945). Research work carried out by several investigators has recently shown the value of this sulphur containing amino acid on histologic changes in the livers of patients with cirrhosis (*J.A.M.A.*, 136, 934, 1948).

The determination of methionine can be carried out by chemical and microbiological methods, the former giving the most accurate results. One of the most reliable of the chemical methods was developed by MacCarthy and Sullivan (*J. Biol. Chem.*, 141, 871, 1941), who utilised the property of methionine forming a coloured compound with sodium nitro-prusside and developed a satisfactory, rapid colorimetric method. Other methods are available utilising colorimetric and gravimetric methods. Assay of amino acids by microbiological methods involves the use of certain groups of bacteria as test organisms, the results being obtained either by turbidmetric or titrimetric measurements.

APPLICATIONS OF VINYL BUTYRAL RESINS

(*continued from previous page*)

treated metal surface but some lacquers based on nitro-cellulose and vinyl resins present difficulties.

In the petroleum and chemical fields a good deal of interest is being taken in the use of these metal conditioners followed by application of vinyl chloride-acetate coatings for pipe lines, oil storage tanks and air conditioning equipment, particularly fans where the corrosion on the edge of the fan blades is very severe. Here the wash primer gives a tight, adherent bonding surface and the vinyl resin topcoating provides wear and abrasion resistance.

Another quite important use for vinyl butyral resins is for modifying phenolic resins to make durable finishes for wooden tanks and for use as a knot sealer for pine lumber.

STANDARD STEELS

Certified Spectrographic Samples

A NEW development in standard steels for analytical purposes and photometric standardisation (construction of graphs) is announced by the Bureau of Analysed Samples, Ltd., Middlesbrough.

A series of eight spectrographic standard steels has been prepared in the form of rods ½ in. by 6 in. long and in fine turnings.

The chemical analyses, tabulated in the ascending order as percentages of each constituent are as follows :—

Silicon	0.01	0.13	0.18	0.25	0.29	0.37	0.62	0.81
Manganese	0.02	0.17	0.36	0.53	0.79	1.11	1.21	1.42
Nickel	0.05	0.18	0.56	0.84	2.08	2.92	4.10	5.15
Chromium	0.04	0.20	0.35	0.53	0.96	1.72	2.34	3.07
Molybdenum	0.01	0.19	0.32	0.43	0.54	0.95	1.29	1.41
Vanadium	0.03	0.12	0.22	0.26	0.36	0.46	0.52	0.65
Copper	0.09	0.11	0.11	0.18	0.23	0.24	0.31	0.50

The analyses were undertaken by the Pig Iron and Low Alloy Steel Analyses Sub-Committee of the British Iron & Steel Research Association.

The spectrographic standards are supplied as a set of eight rods complete with provisional certificate.

The turnings for photometric standardisation and general chemical analyses are supplied in a series of eight bottles, each containing either 100, 50 or 25 grams in each.

New Alkaline Solutions Electrode

THE difficulty associated with the measurement of the *p*H of high alkaline solutions is reflected by the fact that the standard Muirhead *p*H electrodes, made of soda glass, can be used only up to *p*H 10. Above this value sodium ions in the solution contaminate the electrode, causing a semi-permanent reduction in sensitivity.

A new electrode, type D-340-B/3, made from lithium glass, almost sodium free, enables measurements to be carried out up to *p*H 13.5. It is fitted with a green bakelite cap to distinguish it from the standard type D-340-B.

Intended for measurement of values above *p*H 7, the electrode has an overall accuracy of 0.1 *p*H up to *p*H 12.5, and 0.2 *p*H from 12.5 to 13.5. Above *p*H 12 a correction for sodium ion concentration has to be applied, but does not exceed 0.3 *p*H.

A note from Muirhead & Co., Ltd., observes that lithium glass electrodes are sluggish and require time to give steady readings. Up to *p*H 12.5 the time taken is two minutes, and this increases to as much as 15 minutes above this value.

FRENCH MICROSCOPE DESIGN

New Instrument for Metallurgists

The housing of object glasses in the base of the instrument is among several examples of compact, intelligent design of this new French microscope

ONE of the exhibits at the 1950 exhibition organised by the French Society of Physics was a new type of metallurgical microscope, made by Microscopes Nachet de Paris.

Advantages claimed for this instrument, type T.M.67, are its compactness and ease of handling; instant 6 V 5 A light source; a double illuminator for easy changeover from prism to glass system by means of a lateral screw; projecting nose-piece which allows rapid change of eye-pieces, with consequent extensive range of magnification; and a shock absorber system to eliminate vibration and " foggy " negatives.

Incorporated into the optical system are achromatic object-glasses corrected for examination of samples without cover-glasses. These are slide-mounted for quick interchanges. The object-glasses and eye-pieces are designed for rapid and easy determination of the magnification.

Gift to University

A gift by the Firth-Brown companies, Sheffield, of £2000 a year for seven years to Sheffield University, coincides with the start of the university's £350,000 engineering department extension scheme.

Technical Publications

INCLUDED in the recent ABCM report on the British chemical industry was a chart setting out the principal products and the routes by which the raw materials are treated to form final products for other industries. For the benefit principally of students of universities and technical institutions the chart has been reprinted and is now available separately from the report (1s. post paid).

* * *

PHOTO-ELECTRIC controls and a wide range of industrial electronic equipment are described in an illustrated brochure issued by the British Thomson-Houston Co., describing its exhibits at the Mechanical Handling Exhibition, Olympia, London, which ends today.

* * *

DISTINCTION between the two main types of analysers—the indicating and tunable filter class—is explained by H. G. Yates, M.A., in an article on the Muirhead-Pametrada audio-frequency wave analyser in "Technique" (Vol. 4, No. 2) (Muirhead & Co., Ltd., Beckenham, Kent).

* * *

THE chemistry and mode of action of Heparin, and its sources, preparation, standardisation and various forms of administration and application are described in a booklet now available from Evans Medical Supplies, Ltd., Speke, Liverpool.

* * *

A USEFUL and extremely versatile range of photo-electric and electronic equipment is described in the new series of leaflets produced by Radiovisor Parent, Ltd., London, N.W.1. These include a new photo-electric press guard and the recently developed type FR49 Flamestat flame control device for the protection of industrial gas-fired ovens and similar installations. Other leaflets deal with units for indicating the density of smoke emission from chimney stacks, counting moving articles on conveyors, automatically controlling the switching of street lights, and the protection of premises against burglary by infra-red rays. Other applications of invisible ray monitoring system include automatic fire detection, the control of hopper filling, the detection of turbidity in liquids, control of atmospheric visibility, detection of dust leakage, automatic door opening, control of work temperature during certain welding and pre-heating operations. There appear to be specialised applications for almost every trade.

RESISTANCE to sudden stresses and heavy impacts and the long-wearing properties of manganese steel are stressed in an article in the current issue of "Edgar Allen News" (Edgar Allen & Co., Ltd., Sheffield). The series of articles on "Modern Welding Technique" by E. T. Gill and Eric W. Simons is continued.

* * *

THE appearance on June 15 of the first post-war edition of "England" (Ernest Benn, Ltd.) is an event in the history of a series of guide books which, under L. Russell Muirhead's direction, has come to be regarded as the most authoritative. The new Blue Guide to England offers in small and concise form all the essential facts required by business people, holiday-makers, and visitors. In its newly revised form, "England" is completely contemporary, taking account of the latest transport and hotel arrangements, and includes alterations to maps and plans made necessary by the war.

Standardised Safety Gloves

A FURTHER British Standard specification for industrial safety gloves (THE CHEMICAL AGE, 62, 584) just issued by the British Standards Institution (B.S. 1651 : 1950), deals with safety gloves, mittens and handguards for protection against common hazards in all industries. This standard is based on practical trials lasting several years. It is designed to canalise the demand for safety gloves from more than 200 different types now commonly supplied, each type in several sizes, into a range of 17 preferred types, each supplied in a minimum range of sizes. This standardisation aims at facilitating economic production as well as the ordering and stocking of safety gloves. The gloves specified are designed to provide adequate protection, and to overcome weak points existing in the past so as to provide the greatest economy in use.

The gloves fall into five groups: leather, plastics, rubber, felt, and cotton. The standard includes a list of hazards and recommends the appropriate types of gloves for each hazard. Requirements are given for materials, sizes, manufactures and methods of test. Recommendations on the storage and preservation of rubber gloves are included, and a note on the information to be given when ordering gloves.

OVERSEAS CHEMISTRY AND INDUSTRY

NEW TRENDS AT THE MELLON INSTITUTE

Over $3.5 million for Research in 1949

AMPLE indications that the productive U.S. centre of fundamental and applied science research, the Mellon Institute in Pittsburgh, has lost none of its wonted vigour, are contained in the 37th annual report of the director, E. R. Weidlein, on the work during the year ended February 28.

Although expenditure is perhaps the least certain indication of the amount of worthwhile activity, it is interesting to note that the Mellon Institute spent over $3.52 million on pure and applied research in 12 months to March, 1949. Over $1.18 million additionally was devoted as the year's contribution to the long continuing scheme to increase the scope for research by addition of laboratories and ancillary buildings. This block, of four floors, on which work has been going on since 1948, will provide in the end 32 more laboratories, including 22 large ones, and a wide range of subsidiary accommodation.

Biochemistry and Schizophrenia

One of the principal studies in the pure chemistry research programme during the year has been in collaboration with the Illinois Neuropsychiatric Institute (L. J. Meduna) concerning the biochemistry of mental patients, in the course of which some highly original observations have been recorded in biochemistry associated with schizophrenics. A common factor, exhibited by approximately 33 per cent of such mental sufferers, was resistance to insulin. The Mellon department of research in Pure Chemistry has been concerned to isolate and indicate the active principle of an undefined chemical substance derived from the urine of these patients. It is thought to be the anti-insulin factor and it is noted that it produces a large rise in blood sugar when injected into animals.

The pure chemistry department is following the obvious invitation to illuminate, if possible from the chemical standpoint, the likelihood of association between diabetics and mental disorder, *via* the common characteristics of defective metabolism of carbohydrate. The possibility of wider understanding of the cause of human diabetes mellitus is suggested by the evidence already acquired that injection of alloxan in animals induces experimental diabetes.

These studies and a new procedure for the precise determination of alloxan monohydrate in biological materials are only some aspects of an elaborate programme which may conceivably establish highly unconventional fields for chemotherapy.

Notwithstanding the emphasis which continues to be given to many aspects of pure chemistry, the Mellon Institute's great importance as a centre of applied sciences substantially increased during 1949. The many applied science departments now have a staff of 266 Fellows and 248 assistants concerned with 84 fellowships enjoying industrial support.

The number of fellowships in applied science was increased by 12 during 1949. The subjects of the new research are as follows: agglomeration, aromatic anhydrides, arsenic, friction applications, mine-acid treatment, monomers, nickel derivatives, phenolic chemicals, pipe joints, sodium derivatives, special resins and zymology.

Mellon Principles in India

THE outstanding record of the Mellon Institute, since 1913, in promoting progress in industries is acknowledged as being the inspiration of India's recently completed Shri Ram Institute for Industrial Research. To reproduce some similar achievements in India, Sir Shri Ram, formerly chairman of the Delhi Cloth and General Mills, Co., Ltd., Delhi, is stated to have made over his entire savings to establish the institute.

The institute building houses very modern research equipment purchased in England and the U.S.A. and has most up-to-date laboratory facilities. It is the first institute of its kind in India to lay full emphasis on applied and industrial research. Particular stress is being laid on process development work, for which extensive pilot plant machinery has been installed, this also from Britain and America. The general objective is to give an incentive to the rapid development of Indian industries and the foundation proposes to investigate very immediate and long range technical problems. The institute will incidentally also provide Indian industries with experienced research-minded technicians.

FIRE-RETARDING COATINGS

Slower Burning Aircraft Fabric

COATINGS which are said to double the time interval between ignition and destruction of aircraft fabric have been developed in the U.S.A., where it is thought they may substantially reduce some fire hazards.

The tautening of aircraft fabrics is done by using inflammable cellulose derivative dopes. Fire retardant coatings are neither as effective or as permanent, so their application would require to be deferred until after the doping and with due regard for aerodynamic smoothness, adhesion, flexibility and other considerations.

The account of this work, given in the current issue of the *Journal of the Franklin Institute* (249, 2, 409) states that scale wind tunnel tests were carried out on 15 coating systems. Test panels, 12-in. square, with six coats of cellulose acetate butyrate and from one to four coats of fire retardant lacquer were placed in the centre of a steel wing suspended in a 70 m.p.h. air stream.

Aviation spirit was introduced into the air stream in a uniform spray and spark-ignited. The wing section was thus enveloped in burning spirit, ensuring continuous contact with flame during the entire test. The time for destruction of the outer coating and the time of fabric failure were noted; temperatures were recorded by thermocouples and rapid-recording pyrometers.

These tests are said to have indicated that the time for fabric destruction can be increased from the 6 seconds characteristic of cellulose acetate butyrate, to 12 seconds.

Fire retardancy is increased for higher pigment contents but these are not sufficiently durable.

U.S. Innovations

ELECTRICAL insulation claimed to last 10 times longer than any previous types has been developed by the (U.S.) Westinghouse Electric Corporation. It consists of mica flakes embedded in heat-resistant resin which will expand and contract with heat changes in the generator coils.

* * *

A NEW sludge inhibitor, employing as its active principle a liquid form of di-tert-butyl-para-cresol produced by the U.S. Koppers Company, is said to increase the effective life of transformer insulating oils 14 times. The inhibitor will stabilise new and reclaimed oils.

SPAIN'S PHARMACEUTICALS

Developing Uses of Local Flora

RECENT progress of the pharmaceutical and allied branches of Spain's chemical industry were evidenced recently in a paper by A. O. Villalonga, president of the Official College of Pharmacists, of Palma. He pointed out that in the last few years some 6000 drugs and medicaments had ceased to be imported into Spain and were now produced by the country's own manufacturers. He claimed that for most drugs Spain was now independent of the foreign producer. The occasion was the second Semana Farmaceutica Nacional, held in Palma de Mallorca recently.

That this progress may be to an important extent linked with the increasing attention now being given in Spain to the medicinal plants which flourish in certain districts, was suggested by several other papers. Prof. R. St. M. Casamada, whose subject was phytotherapy and its possibilities, offered the opinion that these plants could be considerably developed. He presented examples from both the native and foreign flora for production of anti-malarials, cardiotonics, antibiotics, etc. Among productions from native flora were some anti-malarials of a new type said to be much more potent than the quinines.

Plant chemistry was also the main theme of Prof. Rivas Goday, of Madrid University, in his paper on phytography in which he described the scope of applied botany at the university, including bromatology and biochemistry and its various relations with pharmacy.

A third paper on this subject, by Prof. Perello, of Madrid University, on the pharmaceutical physiology of plants, contained a record of much original work on plant breeding and crossing for medicinal purposes, the production of hybrids by artificial fertilisation and other methods, and other work in this direction during the past three years.

U.S.S.R. Rejects the Cell Concept

The Soviet Academy of Sciences has decided to ban the belief that cells represent the basic form of living matter. It is "a false reactionary theory and a survival of idealism." According to Moscow Radio, the Russian biologist Olga Borisovna Lepeshinskaya "has proved that cells can arise not only from cells but also from living non-cellular matter, which in turn is formed from inanimate matter."

BRITISH AND GERMAN CHEMISTS CONFER

Growing Range of West Zone Production

FURTHER substantial gains in output have been reported by many German chemical manufacturers. The peak production that followed devaluation in November was not overtaken by West German industry as a whole until April, although the output of dyestuffs, soda ash and many other chemicals in March was already 20-30 per cent higher than in that month. March exports of pharmaceuticals amounted to nearly double the November value.

For seasonal reasons, the expansion was particularly marked for fertilisers, but the demand for ammonium sulphate and various nitrates was met without delays throughout April and May, and it is believed that total consumption of nitrogenous fertilisers in the agricultural year ending now will be slightly below 1948-49.

Shipments abroad of chemical products substantially increased during recent months, so much so that the potash industry, for example, had to work overtime and Sunday shifts to meet export as well as domestic demands; the export demand for rock salt, on the other hand, is still insufficient.

The situation in the electro-chemical industry is characterised by the statement of Sued-Chemie AG that the highest pre-war export figures have recently been far exceeded; the company has made plans for substantial plant extensions.

Import Restrictions

Some concern is being felt, however, by chemical exporters because of the evident inability of the Federal authorities to keep foreign trade in balance. Import restrictions by foreign countries have affected German export opportunities, with the result that German purchases of overseas raw materials may have to be cut. It has been impossible to cover the cost of rock phosphates from North Africa by exports of German manufactures to France. Similar difficulties have arisen in trade with Italy, while negotiations are now in progress with Chile to facilitate German purchases of saltpetre under clearing arrangements.

West German industrialists are waiting with marked interest for the outcome of the Anglo-German trade negotiations. German Press reports refer to the meeting in Cologne in the latter part of May between representatives of the Association of British Chemical Manufacturers and spokesmen of the German parallel organisation, Arbeitsgemeinschaft Chemische Industrie. At this third meeting since the war the British and German experts, according to the Press, surveyed in detail the situation of their respective industries and exchanged views on the repercussions of liberalisation of foreign trade. They also discussed specific questions concerning the exchange of goods between this country and Western Germany.

French Delegation

Discussions also took place " in a very friendly atmosphere " between a French delegation led by M. Brulfer of the organisation of the French chemical industry and a German delegation led by Herr W. A. Menne. These discussions were held in Frankfurt on June 1. Both sides, according to a semi-official statement, attached special value to an extensive exchange of information about the two organisations and to a discussion of the basic problems of intra-European and international trade.

The first contacts had shown that constant close and friendly contact was needed for a solution of the chemical problems arising within the framework of the intra-European economic relations, for which the initial steps have been taken, and that the conditions for such contact were " quite favourable."

The Allied High Commission have approved the German proposals for the conversion of the Krupp-Treibstoffwerk plant at Wanne-Eickel to the production of higher alcohols by the Oxyl synthesis process of Ruhrchemie AG, and arrangements were made immediately afterwards for co-operation between these two companies. The catalysts required will be made by Ruhrchemie AG at its catalyst plant, which has been idle since the end of 1949, while Krupp-Treibstoffwerk, GmbH, plans to produce a number of products for which it is hoped outlets will be found, as solvents for paints and lacquers, plasticisers for plastics, and auxiliary products for the detergent industry.

The German proposals also provided for the conversion of the Chemische Werke Bergkamen, the Fischer-Tropsch plant of Essener Steinkohle AG. Here, it had been suggested, operations for the purification of coke-oven gases and removal of poison-

(continued overleaf)

Brazil's Purchasing Programme

Large Sums for Health and Agriculture

BRAZIL'S Five-Year Plan, better known as the SALTE Plan, has been sanctioned by the President of the Republic and comes into force immediately. The plan aims at raising the national standard of health, increasing agricultural production, improving transportation and augmenting supplies of electrical energy and fuel. The total expenditure, equivalent to £427.5 millions, is to be spent in 1950-54.

The equivalent of £50.2 million is allotted to carrying out the first section of the programme, dealing with public health; £13.4 million is earmarked for disinfecting with DDT all zones subject to malaria along the coast and in low-lying valleys of the interior. Important sums are set aside for the purchase of medicines and for aiding Government laboratories and institutions to increase the volume and range of production of preventative and curative drugs.

The programme for expanding agricultural production provides for an expenditure of £52 million. This sum includes the equivalent of over £1 million for preliminary studies and installation of plant to exploit the deposits of apatite at Araxá (Minas Geraes), Jacupiranga (San Paulo) and Camisão (Bahia), and of other mineral fertilisers; £950,000 for the purchase of fertilisers, and £760,000 for increasing production of vegetable substances which can be utilised as fertilisers. Considerable sums are allotted to the purchase of insecticides and fungicides, and to sprinklers and other apparatus for use in combating insect pests and plant disease. A further sum of £2,100,000 is to be expended to foster production and industrialisation of vegetable oils, resins and wax.

Although preference will be given to the purchase of materials locally as far as possible, very considerable quantities will have to be imported.

Apatite Deposits

The known apatite deposits in Brazil are represented as being almost inexhaustible. The reserves at Ipanema, San Paulo, are estimated at 740,000 tons, with 11 to 21 per cent of P_2O_5; those at Jacupiranga, San Paulo, which are to be fully investigated under the SALTE Plan, have a mineral content varying between 22 and 28 per cent. The Morro Serroba reserves, with a similar percentage, are calculated at 500,000 tons, and those at Araxá, Minas Geraes, at 100 million. The latter, and the deposit at Camisã,Bahia, and Monteiro, Paraiba, will be opened up industrially this year. These are only a few of the many deposits awaiting exploitation.

State Aid for Chilean Development

The Corporación de Fomento de la Producción, with the support of the Chilean Government, plans the considerable development of both the products and by-products of its Huachipato steel plant. The making of chemical products, refractory bricks, carbide and ferrous alloys is intended, as well as the installation of a zinc refinery, a cellulose factory and foundries for iron and steel.

BRITISH AND GERMAN CHEMISTS CONFER

(*continued from previous page*)

ous substances could usefully be carried out, but this suggestion has not yet been sanctioned. The cases of Gewerkschaft Victor, Castrop-Rauxel, which was converted to the production of nitrogenous fertilisers, and Krupp-Treibstoffwerk, for which the conversion plans have now been approved, were given priority because both these companies had retained their staffs.

Nothing has been heard lately about another conversion project drawn up by German experts for the use of Fischer-Tropsch plants exempted from dismantling for paraffin synthesis, which in the main yields solid paraffin. Meanwhile German coal-tar interests are pleading for a resumption of hydrogenation operations on the ground that this would bring about a complete transformation of the world market of coal-tar pitch and creosote oil which was the scene of Anglo-German competition.

Bakelite-Gesellschaft, the German company which has been making Bakelite plastics for the past 40 years, has erected a new factory at Pasing near Munich, where the full manufacturing programme of the former works at Erkner near Berlin (which was dismantled in 1945) is being carried on. Zellstoff-Fabrik Waldhof, Mannheim, has discontinued the production of yeast products for feeding purposes and is now engaged on laboratory preparations for the production of pharmaceutical preparations.

· OVERSEAS ·

Soviet Aid for Polish Chemical Industry

Delivery of equipment for the Polish chemical industry is to be expedited by the Soviet Union. Under a six-year plan plants will be installed and equipped for the production of nitrate fertilisers, acetic and sulphuric acid and synthetic phenol.

High-Powered Supersonics

American chemical engineers, describing at the recent Boston meeting of the Institution of Chemical Engineers the acceleration of many physical and chemical processes by the use of ultrasonic waves, estimated that intense vibrations cause violent molecular oscillation within a solution with a force 250,000 times that of gravity.

German Chemicals in Belgium

Following the freeing of importation of German goods, Belgium is reported to have experienced a flood of chemicals, according to the Belgian chemical industry, which is asking the Government to intervene. German prices are reported to be about 30 per cent lower than those in Belgium, while some other common industrial chemicals were said to be from 25 to 50 per cent cheaper.

U.K. Distillation Plant for India

Complete equipment is being provided from Britain for the conversion, recently started, of the liquor distillery at Nasik into a power alcohol factory under the authority of the State Government of Bombay. The plant is expected to produce a million gal. annually and the provisional target for the industry calls for a production of 10 million gal. this year. Over 3.5 million gal. was produced in 1948 and 5 million gal. in the first nine months of 1949.

Planned Increase of Sodium Products

The annual report of the Brazilian government-controlled Cia. Nacional de Alcalis indicates that the present plan to erect a plant in the Cabo Frio area should provide an annual capacity of 100,000 tons of sodium carbonate, and the production of 45,000 tons of caustic soda, 33,000 tons of soda ash and smaller quantities of by-products. The project is expected to bring about a substantial reduction in Brazil's imports of caustic soda and soda ash, which require an annual expenditure of about Cr$ 200 million and Cr$ 80 million respectively.

D

U.S. Fuller's Earth

The output of fuller's earth in 1949 fell by 6 per cent to 320,906 short tons. This is still slightly greater than the five-year average 1945-49 which is 317,435 tons.

Norway's Aluminium Production

Production of aluminium in Norway last year was 35,000 tons, but a potential annual output of 90,000 tons is anticipated by Mr. Johan Murer, managing director of Norsk Aluminium Company, who believes that a good market will be found. The country's total production of aluminium this year is expected to reach 46,000 tons.

Asbestos Cables in Australia

The Cable Makers (Australia), Ltd., New South Wales, is producing asbestos insulated cables, under licence. The insulation is processed to withstand high temperatures and the material is impregnated with heat and moisture-proof cements. The construction of the insulation wall of the cables eliminates laps, joints and seams and the cables are stated to be impervious to deterioration from heat, fumes, oil, grease and vibration effects.

Sugar Company's Chemical Interests

Considerable chemical enterprise is being shown in Australia by a subsidiary of the Colonial Sugar Refining Co., CSR Chemicals, Ltd., at Rhodes. Plastic moulding powder is being made from imported flake and other basic chemicals for the plastic and rayon industries. A pharmaceutical section also went into production recently. CSR research chemists have pioneered processes for the manufacture of certain vitamins and other pharmaceuticals.

Norwegian Plastics

Norsk Hydro, Norway's largest chemical concern, and a pioneer in the field of nitrate fertilisers, is building a factory at Heröya for the production of urea. The output, which is expected to start this autumn, is to be sent to a factory operated by Norske Kunstharpikser, at Lillestrom, for processing into carbamidene for subsequent making into finished plastic products. Another factory, at Odda in West Norway, is being built to produce diacyandiamide. This factory is British-owned, and the material will be exported to Britain for further processing, states the bulletin of the Royal Norwegian Information Service in London.

PERSONAL

New Textile Research Fellow

MR. C. M. KEYWORTH, managing director of C. M. Keyworth & Co., Ltd., Leek, and a skilful research chemist, has been elected a Fellow of the Textile Institute. Mr. Keyworth has carried out research on mercerisation of mixed fabrics with cotton warps and acetate wefts; improvements in crease-resisting cotton and rayon fabrics; and the manufacture of dinitro o-cresol and dinitro a-naphthol for mothproofing purposes.

A non-ferrous metals team, including MR. W. L. GOVIER (Broughton), MR. J. A. THOMPSON and MR. J. W. WILKINSON (Witton), of the I.C.I. Metals Division, sailed for America on June 9. On their return the team will present a report on their two months' tour of U.S. non-ferrous metal plants.

PROFESSOR M. L. E. OLIPHANT, announcing this week his intention to sail for Australia on July 11, to take up his appointment as director of the School of Physical Sciences, Australian National University, Canberra, said Britain's largest atom splitter, the 1000 ton proton-synchroton, being built at Birmingham University, is nearing completion.

Recipients of recent presentations for long service staff and employees of Evans Medical Supplies, Ltd., were MR. G. E. SHAW, of the Evans Biological Institute (25 years); MR. J. GREGSON, drug buyer, head office (25 years); MR. J. P. CARGILL, London representative (40 years); and MR. G. R. DAVIES, representative in Australia (25 years).

The following Parliamentary members have been elected to the Parliamentary and Scientific Committee: LORD CALVERLEY, COLONEL CYRIL BANKS, SIR HAROLD ROPER and MR. AUSTEN ALBU.

The new president of the Pharmaceutical Society is MR. ADAM MELDRUM, Aberdeen, and the vice-president MR. FRANK WILSON, secretary of the Surrey Pharmaceutical Committee, Wimbledon.

DR. VANNEVAR BUSH, the American atomic scientist, was among those on whom honorary degrees were conferred at Cambridge University last week. The public orator (Mr. W. K. C. Guthrie, Fellow of Peterhouse) referred to the doctor's co-ordination of various branches of scientific work during the war. Another American honoured was DR. W. S. MIDDLETON, president of the American College of Physicians.

NEW OFFICERS

Choice of Pesticides Groups

THE following officers and executive committee members will serve during the ensuing year:—

ASSOCIATION OF BRITISH INSECTICIDE MANUFACTURERS
Chairman: Dr. J. R. Booer (F. W. Berk & Co., Ltd.); *vice-chairman*: Dr. E. Holmes (Plant Protection, Ltd.); *hon. treasurer*: Mr. N. K. Smith (The Murphy Chemical Co., Ltd.); *hon. auditor*: Mr. A. G. Ponton (Pan Britannica Industries, Ltd.). *Executive Committee*: Messrs. E. T. Bugge (Bugges Insecticides, Ltd.); R. V. Craven (W. J. Craven & Co., Ltd.); A. T. Davey (Burt, Boulton & Haywood, Ltd.); H. J. Jones (Hemingway & Co., Ltd.); N. K. Smith (The Murphy Chemical Co., Ltd.); F. W. Sugden (Plant Protection, Ltd.). *Secretary*: Mr. W. A. Williams.

ASSOCIATION OF BRITISH SHEEP AND CATTLE DIP MANUFACTURERS announces these appointments:
Chairman: Mr. V. G. Gibbs (William Pearson, Ltd.); *vice-chairman*: Mr. R. Lowe (Chas. Lowe & Co. (Manchester), Ltd.); *hon. treasurer*: Mr. W. E. O. Walker-Leigh (Cooper, McDougall & Robertson, Ltd.); *hon. auditor*: Mr. R. J. Hope (Standardised Disinfectants, Ltd.). *Executive Committee*: Messrs. H. W. Barker (Battle Hayward & Bower, Ltd.); R. J. Hope (Standardised Disinfectants, Ltd.); R. W. Lowe (Chas. Lowe & Co. (Manchester), Ltd.); W. M. Macmillan (Robert Young & Co., Ltd.); D. O. Marshall (Osmond & Sons, Ltd.); A. S. Roxburgh (Roxburgh Morgan & Co., Ltd.); H. O. Waller (Cooper, McDougall & Robertson, Ltd.). *Secretary*: Mr. W. A. Williams.

Fatal Fire at Tar Distillers

AS a result of an accident at the Knottingley works of the Yorkshire Tar Distillers, Ltd., recently, Mr. Alex J. Robertson, 53, research chemist, of Springfield Avenue, Knottingley, lost his life, and his assistant, Harold Chisem, 21-year-old student chemist, of Eastfield Avenue, Knottingley, was taken to Pontefract General Infirmary seriously ill with extensive burns.

Another young assistant, Albert Shay, who was in the laboratory at the time of the accident, said that he had heard liquid gushing from a fusion pot, but was unable to see either of the men at first because of the smoke. He later saw Mr. Robertson emerge with his clothes ablaze. He indicated that his assistant was still in the building. Although both men received immediate attention, Mr. Robertson died within half-an-hour. A native of Surrey, Mr. Robertson had worked for the Yorkshire Tar Distillers for over 20 years.

MOF Appointments

The Minister of Food has approved the appointment of MR. G. D. LUNDIE as Secretary of the Food Standards Committee from June 18, 1950, in succession to MR. K. R. ALLEN who is being seconded to the Treasury. MR. B. W. SMITH has been appointed secretary of the Metallic Contamination Sub-Committee.

BIRTHDAY HONOURS

—

Recognition of Science and Industry

Sir Ben Lockspeiser (K.C.B.)

Mr. George Legh-Jones (Knight)

THE principal award to a scientist in the King's Birthday Honours List, published last week, was the promotion to Knight Commander in the Order of the Bath of Sir Ben Lockspeiser, LL.D., M.I.Mech.E., F.R.Ae.S., F.R.S., Secretary, Department of Scientific and Industrial Research. The importance of science and technology to industry is recognised in the list, which included the following:—

Knights

GEORGE LEGH-JONES, managing director, Shell Transport and Trading Co., Ltd.

JAMES ECKERSLEY MYERS, O.B.E., D.Sc., A.R.I.C., principal, Manchester College of Technology.

JOHN KEAY, chairman, English China Clays, Ltd., for services to china clay and housing industries in Cornwall.

Order of the Bath

K.C.B.

SIR BEN LOCKSPEISER, Secretary, DSIR.

C.B.

ERIC HENRY EDWARDES HAVELOCK, C.B.E., lately administrative secretary of the Agricultural Research Council. Secretary of the Development Commission. TERENCE ROBERT BEAUMONT SANDERS, M.I.C.E., M.I.Mech.E., assistant controller of supplies, Ministry of Supply.

Order of the British Empire

C.B.E.

ARTHUR JOSEPH AMOR, M.D., M.Sc., principal medical officer, Imperial Chemical Industries, Ltd.

PROF. T. J. JENKIN, director of the Welsh Plant Breeding Station, Aberystwyth. H. KING, lately head of the Chemistry Division, National Institute for Medical Research. J. R. K. PATERSON, director, Holt Radium Institute, Manchester. E. A. SHEARING, assistant secretary, Ministry of Fuel and Power. C. A. SPENCER, deputy chief scientific officer, DSIR.

O.B.E.

W. W. DAVIES, senior principal scientific officer, DSIR. J. H. DEVINE, principal executive officer, Board of Trade. JOHN HENRY GARNER, F.R.I.C., chief chemist, West Riding Rivers Board, 1923, chief inspector 1924 until 1949. W. H. GLASS, technical director, Thermotank, Ltd., Glasgow. H. G. LAMONT, senior principal scientific officer, Ministry of Agriculture, N. Ireland. W. J. PICKEN, principal scientific officer, Department of Physical Research, Admiralty. F. SPROXTON, technical director, B.X. Plastics, Ltd., Colchester. F. V. TIDESWELL, senior principal scientific officer, Ministry of Fuel and Power.

M.B.E.

CHARLES ALEXANDER BEATON, design engineer, Monsanto Chemicals, Ltd., Denbighshire. MRS. L. K. BOUGHTON, assistant, Agricultural Research Council. LEONARD FORBES, higher executive officer, DSIR. JOHN JAMES HANTON HASTINGS, A.R.I.C., manager, Research and Development Division, Distillers Company (Biochemicals), Ltd., Speke, Liverpool. (For services in the production of penicillin).

Manchester Electronics Exhibition

The fifth annual Electronics Exhibition organised by the North Western Branch of the Institution of Electronics will be held at the College of Technology, Manchester, on July 18 and 19. Admission will be by ticket, from Mr. A. Hickson, 205, Parrs Wood Road South, East Didsbury, Manchester, 20.

HOME

Cement Production Record

Output of cement in April reached 941,000 tons, which was 26,000 tons more than the previous record established in July. Stocks rose by 11,000 tons to a total of 214,000 tons, the highest level since June last.

Reads Relinquish Agency

Reads, Ltd., of Liverpool, has relinquished the sales agency of the Lima-Hamilton Corporation's sales agency (high-speed can making equipment) for many countries in Western Europe and North Africa.

Seaweed Recovery

Recent work by the Scottish Seaweed Research Association is stated to have solved many of the mechanical problems involved in the harvesting of seaweed. A new survey of seaweed resources is being started to cover an 11-mile stretch of the Dunbar coastline in East Scotland.

Steel Production in May

Despite the incidence of the Whitsun holiday, output of steel in May reached a record annual rate for the month of 16.597 million tons, compared with 16.409 million tons in May, 1949. Production of pig iron was at an annual rate of 9.646 million tons, against 9.7 million tons a year ago.

Zinc Price Again Raised

A further increase of £4 in the price of good ordinary brand zinc, from £123 10s. to £127 10s., delivered, was announced on June 13. The price has steadily risen since the beginning of the year when it was only £85 10s. Recent increases were on May 25 by £4 to £107 10s.; May 30 to £111 10s.; and June 5 to £123 10s. In accordance with the latest rise, prices of zinc oxide were increased by £3 10s. a ton for 2-ton lots, delivered. New rates are: Red seal £119; Green seal £120 10s.; White seal £121 10s.

Chemical Publicity

By the circulation of pictorial literature with the annual accounts, the directors of Evans Medical Supplies, Ltd., have this year perpetuated a novel idea of keeping the stockholders informed of the activities in which the company is currently engaged. With the accounts for 1949, recently issued, was enclosed a reprint from a trade journal of an article describing and illustrating the highly mechanised organisation and installations in that part of the firm's Speke works which carries out finishing and packing operations.

Changed Address

The Chemical Trade Journal removed its offices as from today (June 17) to 147-149 Grand Buildings, Trafalgar Square, London, W.C.2. (Telephone: Whitehall 1873).

Alpine Tour

The British Association of Chemists announced last week-end that there remained a few vacancies for the Chamonix-Mont Blanc tour which the Association is organising, July 30-August 14.

Bottled Gas Development

Scottish Rural Gas, Ltd., of Perthshire Chemical Works, Perth, is to build a factory and offices at Sighthill Industrial Estate at a cost of some £12,500. The company was a pioneer of widespread distribution of bottled gas in Scotland.

New Stage at Grangemouth

The second of two giant water-cooling towers to serve the £12 million Anglo-Iranian oil refinery development at Grangemouth (Stirlingshire) was completed on June 9. It is believed that the construction time of 13 weeks and three days is a world record for a structure of this size and character.

New Plating Plant

Charles Carpenter, Ltd., of Muirhall Road, Larbert, have now completed the construction of a modern plating plant, replacing their older premises on the same site. The new plant is handling a complete range of finishes for various industries, including a substantial volume of electrical industry work.

New Scottish Office

A branch office, at 183 Pitt Street, Glasgow, C.2, has been opened by Joseph Crosfield & Sons, Ltd., soap and chemical manufacturers, Warrington, following the retirement from business of Mr. J. M. Gifford (A. W. Wardrop & Co.), who previously represented the firm's products in Scotland.

Purchase Tax on Plastic Sheeting

Plastic sheeting, generally, is chargeable with purchase tax up to and including 0.015 in. in thickness, but certain types of sheetings are no longer regarded as chargeable. Those now exempt are non-pliable sheetings, paper-backed sheetings and sheetings over 0.012 in. in thickness with leather effects. This information replaces that on page 19 of Notice No. 78, under Group 7 of the Tax Schedule.

The Stock and Chemical Markets

ALTHOUGH profit-taking followed the recent further rise in industrial shares, stock markets have remained more active, and long-dated British Funds, notably 3½ per cent War Loan, were in demand in advance of the issue terms of British Coal stock, which are expected to be announced by the time these notes are in print. This issue will provide interim compensation for colliery companies in respect of nationalisation. It is expected to be followed by repayment of preference shares of some companies and by returns of capital for some ordinary shareholders.

Chemical and allied shares have taken their cue from Imperial Chemicals, which rallied to 41s. 7½d. following the annual meeting, where Lord McGowan referred to a substantial improvement in turnover both at home and abroad. Monsanto have changed hands around 48s. 6d. and Fisons held their rise to 26s. 3d. F. W. Berk further strengthened to 15s. 6d. and Bowman Chemical 4s. shares were 5s. 3d. Brotherton 10s. shares showed firmness at 19s. 6d. on the good impression created by the financial results.

Albright & Wilson 5s. ordinary have been dealt in around 28s. 3d., Amber Chemical 2s. shares were 3s. 3d., Boake Roberts 5s. shares were 26s. and Pest Control 5s. shares 7s. 9d. W. J. Bush 5 per cent preference were 22s. 3d. and British Chemical & Biologicals 4 per cent preference 16s. 9d. William Blythe 3s. shares have been dealt in at over 9s.

Lever & Unilever at 41s. 7½d. held most of their rise, partly owing to confident expectations of a coming announcement to increase the soap ration. The market now remains more hopeful that the Dutch Lever N.V. will be able to maintain its dividend, which would mean an unchanged payment for shareholders in the English company because of the dividend equalisation agreement between the two concerns.

United Molasses have eased to 43s. 9d., but Turner & Newall were active up to 85s. 3d. on hopes of a higher dividend later in the year. The last-named company, the chairman stated at the last meeting, would in future not abide by dividend limitation, but would pay dividends justified by the results of each year. The market is aware that the strong financial position enjoyed by the company has been built up by a prudent policy and is not expecting more than a modest increase in dividend.

British Oxygen shares have been active around 95s. 6d. Borax Consolidated rose further to 54s. 3d., and Dunlop Rubber eased to 62s. 9d. United Glass Bottle at 75s. have again moved in favour of holders and Triplex Glass were active at 23s. 9d. British Glues & Chemicals 4s. shares strengthened to 21s. 9d. Associated Cement were firm and active around 86s. 3d. and British Plaster Board 5s. shares 16s. 6d. awaiting the dividend announcement.

Iron and steels were firm, helped by the new record rate of steel production established last month. Sentiment was unaffected by the Government's statement on its attitude to the Schuman plan for pooling Europe's steel and coal production. Guest Keen have risen further to 46s. 1½d., Stewarts & Lloyds were 55s. 10½d. and Dorman Long 30s. 10½d. Boots Drug changed hands around 50s., Glaxo Laboratories at 50s. 7½d. failed to hold best levels, and British Drug 5s. shares at 8s. were helped by the financial results. Oils were active but showed small movements apart from Ultramar, which were active up to 16s. 4½d. with the debentures substantially higher at £164.

Market Reports

THE volume of trade on the industrial chemicals market continues at a satisfactory level and a fair amount of new home business has been placed during the past week. Inquiries for shipment, too, have been on a good scale and the output generally appears to be adequate to meet all demands. Price movements have been comparatively few, with the exception of the non-ferrous metal compounds, a number of which have shown increases as a result of the higher prices for zinc and copper. A further increase in zinc metal and oxide prices has been announced this week. In the soda products section there has been a steady pressure for supplies of chlorate of soda, hyposulphite of soda and sulphide of soda, the last-named having recently advanced in price.

MANCHESTER.—Although the chemical trade will shortly be adversely affected by annual holiday stoppages at the textile mills and other consuming establishments in this part of the country, the past week has witnessed steady trading conditions on the Manchester market. The soda compounds and most other bread-and-butter lines are being taken up in good aggregate quantities under contracts and a fair number of additional inquiries from home

(*continued on next page*)

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

HILGER & WATTS, LTD., London, S.E. scientific instrument makers. (M., 17/6/50.) May 16, £200,000 deb. stock and a premium of 1 per cent in certain events secured by a Trust Deed dated May 12, 1950; general charge. *Nil. April 4, 1950.

INDUSTRIAL CHEMICALS, LTD., London, W.C. (M., 17/6/50.) May 17, £500 debs., part of a series already reg. *Nil. July 22, 1949.

LONGWORTH, ENTWISTLE, LTD., Manchester, manufacturers of germicides, etc. (M., 17/6/50.) May 13, £400 deb., to J. H. Longworth, Stockport; general charge. *Nil. Sept. 30, 1948.

Satisfaction

NEWBALL & MASON, LTD., Nottingham, manufacturing chemists. (M.S., 17/6/50.) Satisfaction May 16, that property (354 Mansfield Road, Notingham) comprised in a deb. reg. October 28, 1948, has been released from the charge.

Company News

Associated Lead Manufacturers, Ltd.

The trading profit of Associated Lead Manufacturers in 1949 was £1,280,000 (£472,200). The ordinary dividend has been raised from £170,000 to £282,000.

The British Drug Houses, Ltd.

Net profit for year ended December 31: £95,303 (£66,788 in 1948, £73,713 in 1947). The maintenance of the ordinary dividend at 6 per cent was recommended. A scheme has been introduced under which employees of the parent company receive for the first time a bonus calculated in relation to their earnings and to the company's profits.

Brotherton and Co., Ltd.

The first report since the business became a public company in January last year records net profit of £111,079 earned between February 19 to December 31. The ordinary interim of 3s. 6d. per share and the final 6s. 9d. per share per annum are projected.

Laporte Chemicals, Ltd.

Net profit for year ended March 31, 1950, £226,676 (£190,728). Final dividend recommended on ordinary stock of 6 per cent, making a total of 8¾ per cent on the increased capital.

Manchester Oil Refinery, Ltd.

Net profit £77,565, of which it is proposed to apply £20,898 to reduce the intangible assets from £48,398 to £20,000, is reported by Manchester Oil Refinery, Ltd. Initial ordinary dividend of 10 per cent less tax recommended. More than £95,000 is being provided out of profits for the year to meet current and future taxation. In his statement at the second annual ordinary general meeting, the chairman, Mr. H. Stuart Ebben, referred to this as "a sum which appears to your directors to constitute a crushing burden for a growing enterprise."

Shell Transport and Trading Co., Ltd.

Profit in 1949 was £4,828,919 (£4,377,490), of which £886,324 is being allocated to general reserve. The final dividend 5 per cent free of tax (same) brings the payment on the ordinary stock to 7½ per cent for the year.

C. C. Wakefield and Co., Ltd.

Trading profit for 1949 was £1,451,175 (£897,339). The total interim ordinary dividend (£62,562) and the final (£172.047) are unchanged.

Change of Name

The name of the Bexley Chemical Co., Ltd., has been changed to Rouse of Wigmore Street, Ltd.

THE STOCK AND CHEMICAL MARKETS

(continued from previous page)

users as well as on export account have also been reported. The undertone is firm in almost all sections of the market.

GLASGOW.—Business in general has improved during the past week, and now that the amounts of freight adjustments have been taken into account in fixing prices consumers are realising that the additional charges are necessary and improved business is apparent. The export market has been rather dull.

Patent Processes in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2. at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Preparations containing alkali sulphides.—Ciba, Ltd. Feb. 18 1947. 639,998.

Vinyl inter-polymers.—B. F. Goodrich Co. Feb. 19 1947. 639,999.

Methods of making derivatives of N-(cyanoalkyl) dithiocarbamic acids, and the compounds resulting therefrom.—Monsanto Chemical Co. March 6 1947. 640,158.

Insecticides, and methods of application thereof.—Electrolux, Ltd. June 27 1947. 639,937.

Preparation of 4-aryl-4-aminomethyl-piperidine derivatives.—Sterling Drug, Inc. July 17 1947. 640,168.

Production of valuable products from solid carbonaceous materials.—Standard Oil Development Co., and J. C. Arnold. (Standard Oil Development Co.). July 7 1947. 640,096.

Production of guanidine nitrate.—Koppers Co., Inc. July 15 1947. 639,940.

Refining of fatty acids.—Synergic Foundation, Inc. July 17 1947. 639,941.

Utilisation of chryptochrystalline clays as fillers for rubber and other vulcanisable materials.—Compagnie Industrielle De Credit. July 24 1947. 640,169.

Method of producing ammonia from hydrogen and nitrogen.—S. O. B. Odelhog. July 29 1947. 640,170.

Method of producing biosynthetic antimicrobial substances. Upjohn Co. July 30 1947. 639,943.

Process for the dehydrogenation of hydrocarbons.—Universal Oil Products Co. Aug. 6 1947. 639,945.

Barbituric acids.—Sharp & Dohme, Inc. Aug. 7 1947. 639,946.

Hydrogenation of polyallyl alcohol.—N.V. De Bataafsche Petroleum Maatschappij. Aug. 7 1947. 640,171.

Abrasion-resistant coating compositions containing polyethylene.—E. I. Du Pont de Nemours & Co. Sept. 10 1947. 640,177.

Dehydration of coal tar and similar products by distillation.—Soc. Pour l'Exploitation Des Procedes Ab-Der-Halden. Sept. 17 1947. 640,178.

Purification of alcohol.—Usines De Melle. Sept. 19 1947. 640,180.

Process for producing mono-alkylbenzenes and the mono-alkylbenzenes resulting from said process.—Monsanto Chemical Co. Oct. 9 1947. 640,040.

Methods of preparing compositions of matter and the compositions of matter resulting from said methods.—Velsicol Corporation. Oct. 13 1947. 640,183.

Method of producing sodium selenate.—Canadian Copper Refiners, Ltd. Nov. 4 1947. 640,187.

Cellulose ester compositions.—British Celanese, Ltd. Nov. 6 1947. 639,960.

Cellulose derivative compositions.—British Celanese, Ltd. Nov. 6 1947. 639,961.

Process of preparing dihydropyridine derivatives.—N.V. De Bataafsche Petroleum Maatschappij. Nov. 17 1947. 640,189.

Process for the production of melamine.—E. I. Du Pont de Nemours & Co. Dec 1 1947. 639,962.

Manufacture of nuclear halogenated N-dialkylaminoalkyl - N - phenylalkylphenylamines.—Ciba, Ltd. Dec. 5 1947. 640,050.

Manufacture of peroxidic compounds.—N.V. De Bataafsche Petroleum Maatschappij. Dec. 11 1947. 640,192.

Stabilisation of aldehydes.—I.C.I., Ltd., and S. A. Lamb. Dec. 17 1948. 639,964.

Purification of gases.—Bournemouth Gas & Water Co. Jan. 10 1949. 640,065.

Process for producing dihydric alcohol modified melamine formaldehyde condensation products.—Bec, Koller & Co. (England), Ltd. Feb. 5 1948. 640,203.

Synthesis of oxygenated organic compounds.—Standard Oil Development Co. March 18 1948. 640,115.

Polymerisation of vinyl and vinylidene chlorides.—Distillers Co., Ltd., C. A. Brighton, D. Faulkner, S. Lustigman, and K. H. C. Bessant. March 30 1949. 640,120.

Recovery of chlorobenzene. — United States Rubber Co. April 16 1948. 640,213.

Method for preparing hydrogenation catalysts.—Procter & Gamble Co. May 27 1948. 639,972.

Process for the utilisation of solid carbonaceous fuels.—J. C. Arnold. (Standard Oil Development Co.). May 22 1946. 640,699.

Carbon black.—Columbian Carbon Co. Feb. 1 1947. 640,565.

Method for alkylating polystyrene.—Monsanto Chemical Co. March 24 1947. 640,566.

Manufacture of penicillin derivatives.—Merck & Co., Inc. April 3 1947. 640,713.

Mineral oil compositions.—Monsanto Chemical Co. April 11 1947. 640,567.

Process for preparing benzodioxane and benzothioxane compounds. — Monsanto Chemical Co. May 20 1947. 640,570.

Process for the manufacture of insecticides.—W. H. Manger, Jnr. May 23 1947. 640,715.

Production of dichlorostyrene copolymers.—Mathieson Alkali Works. July 11 1947. 640,572.

Production of iridium.—Mond Nickel Co., Ltd., A. R. Raper, and S. J. R. Fothergill. Sept. 28 1948. 640,577.

Lubricating compositions and preparation of co-polymers for use therein.—N.V. De Bataafsche Petroleum Maatschappij. Oct. 6 1947. 640,578.

Anti-corrosive paint or varnish.—Hassle Apotekare P. Nordstroms Fabriker A/B. Oct. 17 1947. 640,729.

Process for the purification of ketones by distillation.—N.V. De Bataafsche Petroleum Maatschappij. Oct. 29 1947. 640,581.

Protective coating for resisters.—Continental Carbon, Inc. Feb. 20 1948. 640,739.

Compositions comprising polymeric materials.—I.C.I., Ltd., D. H. Coffey, O. B. Edgar, T. J. Meyrick, and J. T. Watts. March 1 1949. 640,597.

Process for polymerising olefinic hydrocarbons.—Universal Oil Products Co. April 19 1948. 640,830.

Manufacture of interpolymers of styrene with oil-modified alkyd resins.—L. Berger & Sons, Ltd., L. E. Wakeford, and W. T. C. Hammond. May 5 1949. 640,832.

Production of organo-silicon derivatives.—Soc. Des Usines Chimiques Rhone-Poulenc. May 25 1948. 640,834.

Manufacture of interpolymers of styrene with unsaturated fatty acids and derivatives thereof.—L. Berger & Sons, Ltd., L. E. Wakeford, J. J. Sleightholme, and W. T. C. Hammond. May 19 1949. 640,836.

Polarographs.—Cambridge Instrument Co., Ltd., and G. Jessop. Aug. 9 1949. 640,768.

Manufacture of hard metal carbides and of hard metal compositions containing metal carbides for tools and working implements.—A. Johnson & Co. (London), Ltd., and E. A. Pokorny. May 14 1946. 640,497.

Stabilisation of edible and potable substances against oxidation.—J. E. Nyrop. Jan. 3 1946. 640,241.

Emulsion paints.—L. Berger & Sons, D. H. Hewitt, and L. A. Paxon. April 14 1947. 640,502.

Method for alkylating benzene.—Compagnie Française De Raffinage. July 11 1946. 640,243.

Distillation of tall oil.—Armour & Co. Aug. 19 1946. 640,244.

Processes for producing magnesium hydroxide from magnesium salts in aqueous solutions.—J. S. Seailles. Aug. 26 1946. 640,348.

Method for the preparation of synthetic hide.—J. Seraphim. Aug. 28 1946. 640,245.

Method of recovering tin and the product resulting therefrom.—A. H. Stevens. (Vulcan Detinning Co.). Oct. 31 1946. 640,352.

Control of temperature of reaction in the halogenation of olefinic hydrocarbons.—I.C.I., Ltd., and R. J. Young. Jan. 21 1948. 640,357.

Catalytic contact masses.—O. Reitlinger. Feb. 20 1947. 640,455.

Electrostatic precipitation plant.—W. C. Holmes & Co., Ltd., F. B. Sykes, and P. Pearson. March 5 1948. 640,456.

Method and apparatus for atomising metals or alloys.—Federal-Mogul Corporation. March 28 1947. 640,457.

Method and apparatus for ammoniation of phosphoric acid.—Manufactures De Produits Chimiques Du Nord Etablissements Kuhlmann. April 2 1947. 640,361.

Dehydrogenation process for the production of phenols.—I.C.I., Ltd., A. W. C. Taylor, H. N. Rose, and T. Alderson. April 7 1948. 640,363.

Process for decoloring thermoplastic materials composed on a polyvinyl halide basis.—N.V. Philips' Gloeilampenfabrieken. April 28 1947. 640,460.

Process for the preparation of unsaturated hydrocarbons from unsaturated aldehydes or ketones.—N.V. De Bataafsche Petroleum Maatschappij. May 9 1947. 640,260.

Process for the decomposition of hydrocarbons.—Hercules Powder Co. June 3 1947. 640,368.

Method and appliance for creating artificial fog, mist or smoke.—D. & P. Studios, Ltd., and A. J. Pauley. June 4 1948. 640,266.

Insecticidal composition.—Dow Chemical Co. June 20 1947. 640,371.

Soap composition and method of making the same.—H. F. Johnston. June 23 1948. 640,373.

Hydroxy fatty acid estolide ester-ethers.—I.C.I., Ltd., and E. G. Parry. June 23 1948. 640,464.

Method of preparing non-turbid homogeneous solutions and dispersions of colloids and products so prepared.—General Aniline & Film Corporation.—July 7 1947. 640,270.

Process for effecting catalysed exothermic reactions.—Universal Oil Products Co. July 22 1947. 640,466.

TAXED TRANSPORT

Price Rises Inevitable

"NO other taxes could have been imposed which would have a more damaging effect on the country's economy; they should be withdrawn." This is the verdict of the British Road Federation, in an informative brochure entitled: "The Case against the extra 9d. a gallon Tax on Motor Fuel and 33⅓ per cent Purchase Tax on Commercial Vehicles." This makes clear that the tax on motor fuel, 1s. 6d. a gallon, is almost 100 per cent. Only semi-luxury articles have had to bear this amount of tax and there could be no possible justification for including motor fuel—which is essential to industry—in this category, states the federation.

It also publishes opinions from a number of its members, among whom the Road Emulsion Association says: "Replies from members estimate that increase on petrol will be between 5 per cent and 7 per cent on haulage costs, or just over 1d. per gallon on our materials. This is not taking into account the fuel used by executives and representatives, which will probably bring it up to about .25d. per gallon, when purchase tax on the commercial vehicles is taken into consideration. These charges will undoubtedly have to be passed on to the customer as the industry is working on a very small margin and will not . . . be able to absorb these extra costs. One of our members who makes paints estimated that the increase in the cost of solvents, white spirit and naphtha, will make 10 per cent increase on the cost which they will have to pass on to the customer."

Conserving Coal Reserves

AT a meeting of the NCB Coke Oven National Consultative Council in London on June 6, Sir Charles Ellis recalled the foundation of the Coal Survey some years before the war, and observed that the service was now half as large again as it was when the board took over the mines in 1947.

Dr. W. Idris Jones, Director-General of the NCB's scientific department, said that the board had reviewed all the coals in the country so as to make it easier to blend different qualities in coke ovens.

At the board's central research establishment, near Cheltenham, experimental coke ovens were being installed to enable the physical properties of coals suitable for coking to be studied for practical application.

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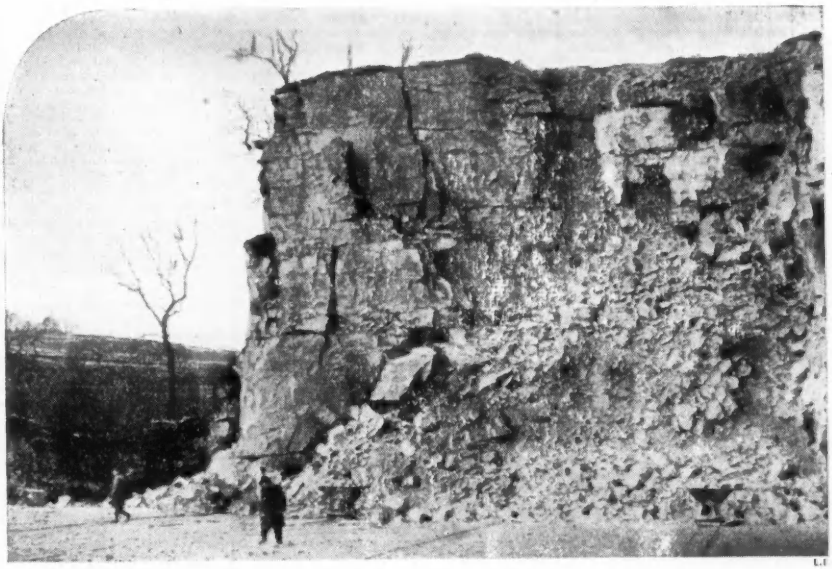

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ANGLO-IRANIAN Oil Company has vacancies for **MALE TECHNICAL ASSISTANTS.** They are required for the analysis and testing of petroleum and its products. Applicants should be in possession of Higher School Certificate or Inter B.Sc., and should be prepared to proceed overseas if required. Age 20-25. Salary according to age, qualifications and experience. Write, giving full details, quoting Department M.1325, to Box No. 5859, at 191, Gresham House, E.C.2.

BAMAG Limited Chemical Engineers of Rickett Street, London, S.W.6, require Draughtsmen of good technical education and preferably having experience in Process Industry. Remuneration in excess of A.E.S.D. Rates payable to first-class men.

CHEMICAL ENGINEERS. Excellent prospects and permanency offered to experienced Chemical Engineers by The Bahrein Petroleum Company Limited, Persian Gulf. Applicants must possess a B.Sc. Degree or equivalent from a recognised Engineering School. Men, who in addition to their Chemical Engineering training, have had training in Mechanical Engineering and practical experience in designs problems applicable to the distillation and fractionation of hydrocarbons common to crude oil and coal-tar refining or chemical plants and other allied industrial processes, are preferred. Salaries according to qualifications and experience. plus kit allowance, provident fund, free board, air-conditioned living accommodation, medical attention and transportation costs. Agreements, 24 to 30 months, with paid leaves. Write, giving full particulars of qualifications, age, education, experience and salary required, to **Box 3427, c/o Charles Barker & Sons, Ltd., 31, Budge Row, London, E.C.4.**

CIVIL ENGINEERS. Excellent prospects and permanency with Bahrein Petroleum Company Limited, for Civil Engineers not over 40 years of age, with Degree and experience of design and erection of steel and reinforced concrete supporting structures as encountered in oil refinery or similar heavy chemical process plants. Twenty-four to thirty months agreements, with passages paid, kit allowance, provident fund, paid leaves, free messing and air-conditioned accommodation. Low living costs. Write, with full particulars of age, experience, education and salary required, to **Box 3428, c/o Charles Barker & Sons, Ltd., 31, Budge Row, London, E.C.4.**

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DESIGNS ENGINEERS. Excellent prospects and permanency with Bahrein Petroleum Company Limited, for Mechanical Engineers, not over 40 years of age, with B.Sc. Degree or equivalent qualifications. Experience required in design and/or construction of oil refineries, coal-tar, chemical distillation plants, or similar involving electrical and steam systems, pressure vessels, fractionating columns, heat exchanges and pumping equipment. Twenty-four to thirty month agreements, with passages paid, kit allowance, provident fund, paid leaves, free messing and air-conditioned accommodation. Low living costs. Write, with full particulars of age, experience, education and salary required, to **Box 3429, c/o Charles Barker & Sons, Ltd., 31, Budge Row, London, E.C.4.**

THE Midland Tar Distillers Ltd., Oldbury, Nr. Birmingham require **CHEMICAL ENGINEERS** possessing a Degree in Chemical Engineering or A.M.I.Chem.E. Applicants must have had several years industrial experience in Chemical Engineering and development work. A first hand knowledge of the oil refining industry an advantage. Full particulars to : Personnel Manager.

SITUATIONS VACANT

THE Civil Service Commissioners invite applications for appointments as **SENIOR SCIENTIFIC OFFICER** and **SCIENTIFIC OFFICER,** to be filled by competitive interview during 1950. Interviews began in January and will continue throughout the year, but a closing date for the receipt of applications earlier than December, 1950, may eventually be announced. Successful candidates may be appointed immediately. The posts are in various Government Departments and cover a wide range of Scientific research and development in most of the major fields of Fundamental and Applied Science. Candidates must have obtained a University Degree in a Scientific subject (including Engineering) or in Mathematics, with First or Second-class Honours, or an equivalent qualification, or possess high professional attainments. Candidates for Senior Scientific Officer posts must in addition have had at least three years' Post-Graduate or other approved experience. Candidates for Scientific Officer posts taking their degrees in 1950 may be admitted to compete before the result of their Degree examination is known.

Age limits : For Senior Scientific Officers, at least 26 and under 31 on 1st August, 1950 ; for Scientific Officers, at least 21 and under 28 (or under 31 for established Civil Servants of the Experimental Officer Class) on 1st August, 1950.

Salary scales for men in London : Senior Scientific Officers, £700 by £25 to £900 ; Scientific Officers, £400 by £25 to £650. Rates for women are somewhat lower.

Further particulars from **The Secretary, Civil Service Commission (Scientific Branch), 7th Floor, Trinidad House, Old Burlington Street, London, W.1,** quoting No. 2887.
6773/200/JH.

THE Civil Service Commissioners invite applications for permanent appointments as **ASSISTANT EXPERIMENTAL OFFICER,** to be filled by competive interview during 1950. Interviews will be held throughout the year, but a closing date for the receipt of applications earlier than December, 1950, may eventually be announced either for the competition as a whole or in one or more subjects. Successful candidates may expect early appointments.

The posts are in various Government Departments and cover a wide variety of Scientific (including Engineering) qualifications. Places of work are spread throughout Great Britian.

Candidates must be at least 17½ years and under 26 years of age (or under 31 for established Civil Servants of the Assistant (Scientific) Class) on 1st August, 1950 : time spent on a regular engagement in H. M. Forces may be deducted from actual age. Candidates must have obtained the Higher School Certificate with Mathematics or a Science subject as a principal subject, or an equivalent qualification ; but candidates without such qualifications may be admitted exceptionally on evidence of suitable experience. Higher qualifications will be regarded as an advantage to candidates over the age of 20.

The inclusive London salary scale (men) is £230-£490. Salaries for women and for posts in the Provinces are somewhat lower. Superannuation provision is made under the Superannuation Act.

Further particulars and forms of application from the **Secretary, Civil Service Commission, Scientific Branch, 7th Floor, Trinidad House, Old Burlington Street., London, W. 1.,** quoting No. 3068. Completed application forms should be returned as soon as possible.
6742/250/DVL.

FOR SALE

600

MIXING MACHINES

TWO **BLAIR CAMPBELL** Jacketed Trough **MIXERS.** Copper-lined troughs, 4 ft. 6 in. by 3 ft. 6 in. by 3 ft. deep, with twin "Z" blades and glanded bearings. Counterbalanced domed cover. Hand-operated tilting. Pulley driven through gearing. 15 h.p. required to drive.

MELVIN Steam-jacketed Trough **MIXER,** 3 ft. 2 in. by 2 ft. 9 in. by 2 ft. 6 in. deep. Twin Naben blade agitators with glanded bearings. Mechanical tipping off main drive. Trough tin sprayed internally. Drive by 10 h.p. slipring motor 200/3/50, by B.T.H. through Radicon reduction gear.

Six Jacketed **MIXERS** by **BAKER PERKINS.** Trough, 31 in. by 28½ in. by 28 in., twin Naben-type blade agitators. Hand-operated tilting. Trough fitted aluminium cover. Direct drive by T/E geared B.T.H. motor, 400/440/3/50.

Three Double-trough Type Jacketed **MIXERS** by **WERNER PFLEIDERER.** Trough, 24½ in. by 24½ in. by 19½ in. deep, fitted double-fin type agitators. Driven at variable speeds through single machine-cut gearing from clutch-operated driving and reversing pulleys. Hand-operated tilting. Agitators can be used whilst tilting. 10/15 h.p. required to drive.

Horizontal **MIXER** by **KRUPP.** Internal dimensions, 5 ft. by 5 ft. by 5 ft. Non-tilting, double-trough type, heavy twin "Z" blades. Bottom slide discharge. Drive by 50 h.p. 480V. D.C. motor through gearing.

Eight Double-trough Type Jacketed **MIXERS** by **WERNER PFLEIDERER.** Internal dimensions, 2 ft. 4½ in. by 2 ft. 5 in. by 2 ft. 3½ in. deep. Fitted twin double-fin type agitators, driven through gearing by pulleys. Hand-operated tilting. 10/15 h.p. required to drive.

Horizontal Steam-jacketed Phosphor-bronze Tilting **MIXER** by **MELVIN,** 2 ft. 5½ in. by 2 ft. 2½ in. by 2 ft. deep. Twin PB double Naben type agitators. Hand-operated tilting. Drive by pulleys through gearing. Pulleys complete with belt striking gear.

Three C.I. Horizontal Double-trough, Steam-jacketed **MIXERS** by **SMEDLEY.** Internal dimensions, 3 ft. 6 in. by 3 ft. 6 in. by 2 ft. 3 in. deep. Double Naben type agitators. Fast and loose pulley drive. Power tilting, clutch operated.

DUPLEX MIXING and Kneading Machine by **MORTON OF WISHAW.** Steam-jacketed trough, 42 in. by 38 in. by 30 in., working capacity, 115 gallons. Fitted twin gunmetal double Naben type agitators. Counterbalanced lid secured by quick-release clamps. Int. W.P., 15 lb. sq. in. or high vacuum, 30 lb. sq. in. in jacket. Power-operated tilting. 25/30 h.p. required to drive.

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PHONE 98 STAINES

GARDNER **MIXER,** 5 ft. by 1½ ft. by 2 ft. deep, 5 h.p., 400/3/50.

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Twin "Z"-blade Electric Tipping **MIXERS,** tinned pan, 30 in. by 28 in. by 22 in. deep and 20 in. square. Also 16 in. by 16 in. by 14 in. deep.

Two—30 ft. by 9 ft. diam. **STORAGE TANKS,** 12,000 gallons.

Jacketed Unused Vacuum **OVENS,** 8 ft. by 5 ft., 7 ft. by 4 ft., and 7 ft. by 3 ft. diam.

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STAINES

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VARIOUS MIXERS FOR SALE

No. 200 ONE nearly new **WERNER PFLEIDERER JACKETED MIXER OR INCORPORATOR.** Low type, with C.I. built mixing chamber, 28 in. by 29 in. by 27 in. deep, with double "U"-shaped bottom which is jacketed, and double fish-tail or fin-type agitators geared together at one side, with belt-driven friction pulleys, 34 in. diam. by 5 in. face, with hand-wheel operation and hand-operated screw tilting gear. Machine fitted with machine-cut gears, covers, gear guard, cast-iron baseplate, and measuring overall approximately 7 ft. by 6 ft. by 4 ft. high to the top of the tipping screw

No 204 One **WERNER PFLEIDERER MIXER OR INCORPORATOR,** similar to the above, with a C.I. built pan 25 in. by 25 in. by 19 in. deep, belt pulleys 26 in. diam. by 5 in. face, double fin-type agitators, and mounted on C.I. legs.

No. 205 One larger **WERNER-TYPE MIXER OR INCORPORATOR,** by Dobson & Barlow, with C.I. built pan or mixing chamber, of the double "U" type, 4 ft. 6 in. by 3 ft. 7 in. by 3 ft. 10 in. deep, with a jacketed bottom and sides to within about 12 in. of top, and fitted with double "Z" type agitators, counterbalanced cover, machine-cut gears at each side, steel backframe with counterbalancing weights and self-contained belt-driven tipping gear and main triple fast and loose belt pulleys 30 in. diam. by 6½ in. face, with belt fork. Approximate overall sizes, 12 ft. long by 8 ft. wide by 10 ft. high.

No. 206 One **DITTO** of the same pattern, by **DOBSON & BARLOW**

No. 208 One **DITTO** by **WERNER PFLEIDERER,** with a C.I. built pan or mixing chamber, of the double "U" type, 4 ft. 5 in. long by 3 ft. 8 in. by 33 in. deep, with double "Z" mixing arms, gears at each end, hand-operated tilting gear, with steel backframe, counterbalancing weights and chains, and fast and loose pulleys 3 ft. diam. by 6 in. face.

No. 209 One **HORIZONTAL "U"-SHAPED MIXER,** steel built, riveted, measuring about 8 ft. 3 in. long by 3 ft. wide by 3ft. 3 in. deep, with horizontal shaft, fitted with boited-on mixing arms about 18 in. long by 4 in. wide, with intermediate breakers, and driven at one end by a pair of spur gears, with countershaft, fast and loose belt pulleys, outer bearing and plug cock type outlet at the opposite end, mounted on two cradles fitted to two R.S.J. running from end to end.

No. 210 One **HORIZONTAL MIXER** as above.

No. 211 One **HORIZONTAL MIXER** as above.

These three "U"-shaped mixers are in some cases fitted with steel plate covers and a steam jacket round the bottom and extending to within about 18 in. of the top with plain end plates.

Further details and prices upon application

Write RICHARD SIZER LIMITED, ENGINEERS CUBER WORKS HULL.

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